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DAIRY ECONOMICS

HANDBOOK



PREFACE

This handbook is intended as a "tool" for leaders who influence thinking and contribute to better understanding of the dairy industry.

Several factors peculiar to the industry were responsible for development of the handbook. Milk is a bulky perishable raw material used daily in almost every home. Many regulations affect milk throughout the production and marketing process. The influences of supply and demand and pricing procedures may be difficult to understand. Recent technological developments have accentuated the cost-price squeeze for producers, processors, and distributors.

Another problem is that of keeping up with the large amount of information already available, and new information as it is issued. A number of selected references are given. Five areas of subject matter of

concern to many are covered. The purpose is to (1) *bring about a better understanding of the industry*, (2) *develop better understanding of the function of price*, (3) *increase awareness of Government's role*, (4) *consider current beliefs on production response to changes in price*, and (5) *suggest a layman's approach to forecasting*.

This subject matter should lend itself to many educational topics—marketing, public affairs, adjustments arising from technological developments, forecasting, and current developments. It is hoped this information will be useful in projecting Extension programs, especially where an analysis of the dairy situation is desired; also in helping people make decisions, develop policies, and take action in the long time public interest, based on economically sound facts.

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DAIRY ECONOMICS HANDBOOK

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The use of cows for milk goes far back in history. The dairy industry as we know it today has changed drastically from its beginning. More changes have occurred in the past 75 or 100 years than in all previous centuries.

Change . . . is it a mark of progress?

With its roots firmly implanted on the eastern seaboard the dairy industry moved westward as population shifted inland. During this period the growing young industry felt the impact of changing transportation, new machinery, advancing research and organizations, and the dynamic leadership of certain of its members.

More change . . .

Like other branches of agriculture, dairying tended to specialize in various parts of the country. Around big cities the market milk industry developed. More people and bigger cities brought about the expansion of milksheds from which supplies were drawn. About 1840 milk began to be shipped by railroad. This enabled more distant farmers to share in the market milk business. Some of the more distant dairymen had advantages of lower production costs. Later, trucks came and accelerated the expansion.

And more change . . .

Further away from the urban markets processing

plants developed for manufacturing dairy products, butter, cheese, canned milk, and more lately powdered milk. Advancing technology left its impression in the manufacturing areas, too,—fewer but larger plants, mechanization and labor-saving devices, more competition, bigger organizations, to name but a few of the consequences of progress.

Still more change . . .

One of the major contributing factors to the ever-changing dairy industry has been the consumer. The effect of consumer decisions is clear. The shift from butter to margarine is an example. During the 1940's total milk production did not change much, although population was increasing. Milk needs for the increasing population were met without a proportional increase in total milk supply. This was done by diverting a portion of the milk supply that had formerly been used for butter to other uses such as fluid, cheese, ice cream and dried milk.

Farmers have changed their method of marketing milk. They shifted from selling farm-separated cream to whole milk. This increased the supply of nonfat solids for human use. In the 1930's only about half of the nonfat solids was used for food, the rest was fed to animals or wasted. Today over three-fourths of this portion of the milk supply is being used by people.



Change . . . change . . . change . . .

More recently the dairy industry has been affected by the Second World War. Increased production of milk was encouraged by subsidies for nearly 3 years during the war. At the same time price ceilings held down the cost to consumers. Through these means both production and consumption were encouraged.

Most of the important changes mentioned here took

place within a framework of relatively free or unregulated economic forces. It is generally accepted that some degree of industry regulation is in the best interest of all groups. However, it also seems generally accepted that regulations should not interfere with adjustments that will be to the long-run advantage of the dairy industry. Lack of flexibility can impede changes which so far have been a mark of progress.

PART 1. THE DAIRY INDUSTRY—A BIRD'S-EYE VIEW

Importance of the Dairy Industry

- Dairy products furnish essential food nutrients in almost every home daily.
- Out of every dollar the average consumer spends for food for home use, about 17 cents goes for dairy products.
- About 1.5 million farmers sold some milk or dairy products in 1955.
- About 20 cents out of each dollar of cash receipts from farm marketings in 1956 came from dairying in the United States. (Table 1.)

Regulations to Safeguard Consumers

Milk is highly perishable, bulky (87 percent water), easily contaminated, and a favorable medium for bacterial growth. Fluid milk is one of our most important foods, both for health and in quantity consumed. Milk has become subject to many laws and regulations of local, State, and National governments. This stems mainly from the need for strict sanitary practices in production and distribution. Also wide use of the product by consumers has further contributed to acceptance of legal requirements of many kinds.

The earliest milk regulations were primarily concerned with protection against fraud and adulteration. Regulations were later broadened to cover other factors affecting health and sanitation. The obligation of the municipal authority to protect consumers by milk ordinances was stated in 1914 in a decision of the Illinois Supreme Court, as follows:

"There is no article of food in more general use than milk, none whose impurity or unwholesomeness may more quickly, more widely, and more seriously affect the health of those who use it. The regulation of its sale is an imperative duty that has been universally recognized."

The courts have continued to uphold the legality of milk ordinances to protect the public health. This is especially true in those instances where the provisions were reasonable and not discriminatory. However, the trend is toward a broader interpretation of ordinances

TABLE 1.—*Source of cash receipts from farm marketings in the United States, 1956*

Commodity	Value	Percentage of total
	<i>Millions</i>	
Cattle and calves.....	¹ \$5,307	17.47
Dairy products.....	4,478	14.74
Hogs.....	2,610	8.59
Eggs.....	1,789	5.89
Broilers.....	840	2.77
Turkeys.....	339	1.12
Sheep and lambs.....	330	1.09
Chickens and other poultry.....	250	.82
Wool.....	114	.37
Other livestock and products.....	193	.64
Total livestock and products..	16,250	53.50
Cotton lint and seed.....	2,518	8.29
Fruits, nuts, and related products...	2,348	7.73
Wheat.....	1,779	5.86
Corn.....	1,589	5.23
Tobacco.....	1,163	3.83
Truck crops, vegetables.....	1,235	4.07
Soybeans.....	924	3.04
Potatoes.....	458	1.51
Hay.....	322	1.06
Barley.....	240	.79
Rice.....	239	.79
All other crops.....	1,307	4.30
Total, all crops.....	14,122	46.50
Total, all commodities.....	30,372	100.00

¹ About 28 percent (\$1,486 million) of the value of all cattle and calves comes from cattle that farmers say are kept primarily for milk. This amounts to 4.89 percent of the total cash receipts, or 19.63 percent for dairy products and value of dairy animals sold for slaughter.

The Farm Income Situation, Agricultural Marketing Service, U. S. Department of Agriculture, July 1957.

when it appears that they interfere with trade beyond the requirements of health and sanitation. A recent example is the case of the *Dean Milk Co. vs. City of Madison*. Here the United States Supreme Court reversed the decision of the Wisconsin Supreme Court. The original ordinance imposed a 5-mile limit on the location of pasteurization plants selling milk in Madison. It was pointed out that Madison consumers would be adequately safeguarded if the city had relied on the provisions of Section 11 of the U. S. Public Health Service Model Milk Ordinance.

The marketing of milk and its products now is subject to Federal, State, and local food, drug, and related laws and ordinances. Dairy products entering interstate commerce are subject to the Federal Food, Drug, and Cosmetic Act and regulations issued thereunder. Milk for consumption as fresh milk is subject to sanitary regulation by State and local authorities. The U. S. Public Health Service sets standards for milk served on carriers in interstate commerce.

Where Milk and Its Products Come From

Milk is produced in nearly every county in the Nation. According to the 1954 census of agriculture 2.9 million farmers were milking at least 1 cow each. Of this number about 1.5 million were producing dairy products for sale, and the others were apparently milking cows for family use.

Although milk is produced throughout the country, production is highly concentrated in certain States. The 10 States listed in table 2 produced 61 percent of the Nation's milk supply in 1956. Note that Wisconsin produced nearly twice as much milk as New York, its nearest competitor, and 4 times as much as Missouri, which ranked 10th in production.

Half of the butter was produced in the West North Central States with Minnesota leading. The East

Where our dairy products come from



North Central States produced 58 percent of the cheese, and Wisconsin produced three-fourths of that amount.

Because of bulk and refrigeration requirements, frozen dairy products are produced near the point of consumption; therefore production is heaviest in Pennsylvania, New York, and California.

Utilization of the Milk Supply

Since 1940 a greater proportion of the total milk supply has been going into fluid use, cheese, and frozen dairy products, as shown in figure 1 and table 3. The use of butter has declined substantially. During the Second World War, production of evaporated, condensed, and dry whole milk expanded to meet military and civilian demands and has since leveled off at about the prewar percentage. In recent years about three-fourths of the Nation's milk production has gone into two major uses. About half of the total supply has been used in fluid form and about 25 percent for butter. The remaining one-fourth has been used for cheese, evaporated, condensed, and dry whole milk, and fed to calves.

Per Capita Consumption of Milk in All Forms

Taking the whole milk equivalent of all forms of dairy products, per capita consumption has shown a

TABLE 3.—Major uses of milk in the United States, 1940 and 1956

Major uses of milk	1940		1956	
	Bil. lbs.	Per-cent	Bil. lbs.	Per-cent
Fluid milk and cream—off the farm.....	30.1	27.0	49.7	39.5
Consumed on farms as milk and cream.....	13.6	12.2	10.0	8.0
Creamery butter.....	36.8	33.0	28.0	22.3
Used for farm butter.....	8.1	7.3	3.0	2.4
Cheese.....	7.9	7.0	13.8	11.0
Frozen dairy products.....	3.8	3.4	8.5	6.8
Evaporated, condensed, and dry whole.....	6.1	5.5	7.1	5.6
Fed to calves, and other uses..	5.1	4.6	5.6	4.4
Total milk production..	111.5	100.0	125.7	100.0

downtrend since 1940 (fig. 2). Spread over the total period this decline has been about 6 pounds a year per person. The downtrend leveled off recently with a slight increase in consumption per capita beginning in 1954. Part of this recent upturn has been the result of increased supplies furnished from the Commodity Credit Corporation stocks or from supplies bought wholly or in part with Government funds. The special school milk program has been especially important during this latter period.

TABLE 2.—Milk production and manufacture of selected dairy products by Regions and for the 10 leading States, 1956

Region or State	Total milk produced		Factory production				
			Butter	Cheese ¹	Evaporated	NFDMS ²	Frozen products
	Bil. lbs.	Percent			Percent		
North Atlantic.....	22.2	17.7	3.1	9.4	2.8	13.4	26.1
East North Central.....	37.3	29.7	29.2	58.3	37.4	40.6	21.9
West North Central.....	27.6	21.9	54.1	15.4	10.9	34.6	10.1
South Atlantic.....	9.2	7.3	.8	.4	8.1	1.2	12.0
South Central.....	14.6	11.6	4.9	10.4	21.8	1.5	14.4
Western.....	14.8	11.8	7.9	6.1	19.0	8.7	15.5
United States.....	125.7	100.0	100.0	100.0	100.0	100.0	100.0
Wisconsin.....	16.9	13.4	17.5	43.4	15.9	31.0	4.5
New York.....	9.9	7.9	2.0	7.4	(³)	9.6	13.0
Minnesota.....	9.4	7.5	21.7	5.0	(³)	24.8	3.7
California.....	7.3	5.8	1.6	1.1	10.2	3.1	14.0
Pennsylvania.....	6.5	5.2	.9	.8	(³)	2.2	14.3
Iowa.....	6.3	5.0	13.6	2.1	(³)	5.1	2.8
Ohio.....	5.8	4.6	3.6	2.8	10.2	3.6	9.4
Michigan.....	5.5	4.4	3.0	2.5	3.8	3.3	6.8
Illinois.....	5.2	4.1	3.4	6.3	5.9	1.2	8.6
Missouri.....	4.2	3.3	4.2	7.1	5.4	2.6	4.4
Total—10 States.....	77.0	61.2	71.5	78.5	⁴ 51.4	86.5	81.5

¹ Does not include full skim American or cottage cheese.

² Nonfat dry milk solids.

³ Not shown for States when made by less than 3 plants.

⁴ Total includes only 6 States.

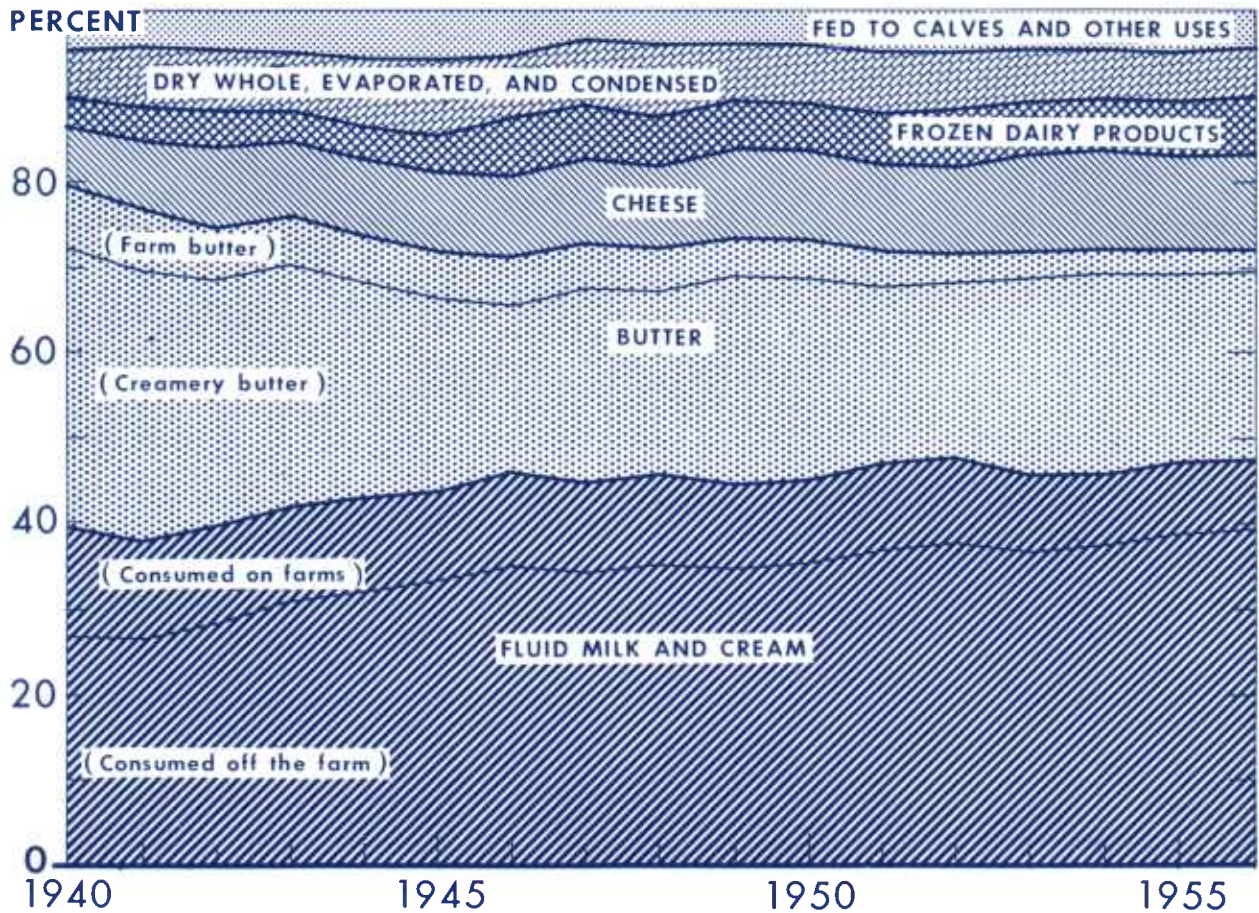


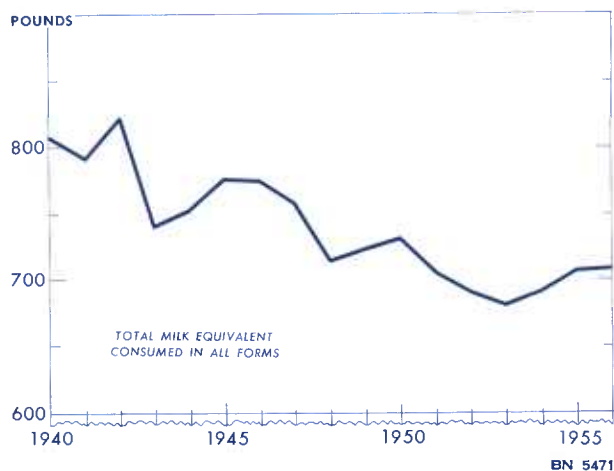
Figure 1.—Percentage of United States milk production going into major uses, 1940-56.

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The significance of the longtime decline in per capita consumption is important. The 1940-56 decline in per person usage represents the disappearance of a market that would have consumed the 1956 production of Wisconsin, the leading dairy State.

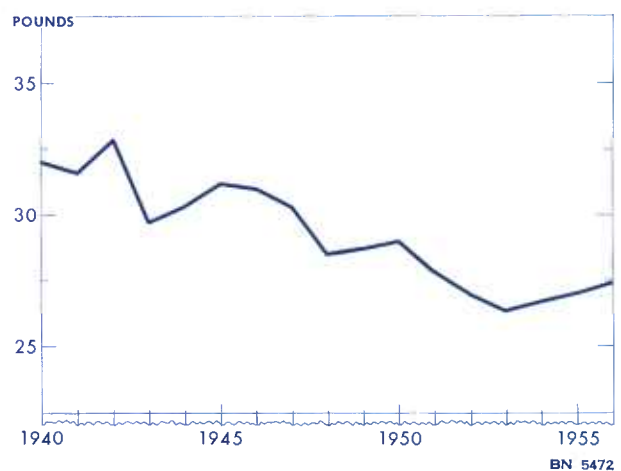
Utilization of Milk Fat

The use of milk fat in all forms is shown in figure 3. Milk fat has always been worth more per pound than solids-not-fat. Consumption of milk fat per per-



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Figure 2.—Milk consumption per capita in all forms, 1940-56.



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Figure 3.—Per capita consumption of milk fat, 1940-56.

son declined from a high of 32.8 pounds in 1942 to a low in 1953 of 26.4 pounds. The amount consumed through different dairy products shifted far more than the figures indicate. Except for about 3 percent fed to calves all the milk fat produced is used for human food.

Utilization of Milk Solids-Not-Fat

Per capita consumption on a solids-not-fat basis (fig. 4) increased at the rate of about one-half pound per year. Until recently a substantial proportion of the solids-not-fat has been unavailable for human use. Much of it was retained on farms and therefore did not enter commercial channels. A substantial increase has occurred in the proportion of this component of milk marketed. Nearly 80 percent has been used for food in recent years, as compared with 50 percent two decades earlier. While the use of milk fat has been declining, the use of most dairy products containing solids-not-fat has been increasing.

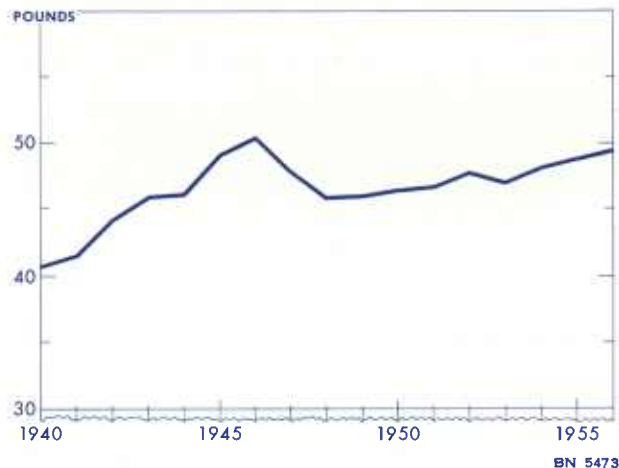


Fig. 4.—Per capita consumption of milk solids-not-fat, 1940–56.

On the average, whole milk as produced contains about $2\frac{1}{4}$ pounds of solids-not-fat for each pound of milk fat. On this basis milk testing 4 percent butterfat would contain 9 pounds of solids-not-fat, or a total of 13 pounds of solids per hundredweight. At the per capita rate of consumption in 1956 for every pound of milk fat consumed, the average consumption of solids-not-fat was 1.8 pounds.

Consumption of Fluid Milk and Cream

As shown in figure 1 there has been a substantial increase in the total consumption of fluid milk and cream (whole milk equivalent basis). During the period referred to this increase has averaged almost a billion pounds a year.

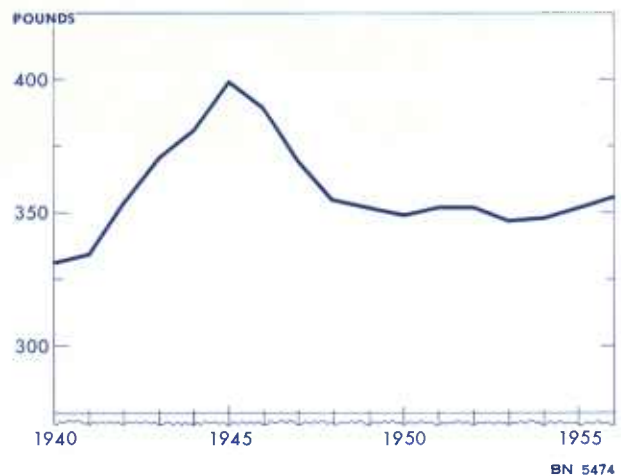


Figure 5.—Per capita consumption of fluid milk and cream,

Per capita consumption of fluid milk and cream (fig. 5) increased sharply during the early 1940's. During the war milk was fairly plentiful as compared with other consumer items. Incomes were high, and milk prices were under ceilings during the emergency. Lack of other consumer goods encouraged even more sales of milk and cream. This resulted in a peak of 399 pounds per capita in 1945. Although per capita consumption of fluid milk and cream dropped sharply after the war, it held some of the wartime gains and stayed well above the average consumption of 330 pounds per person in the period 1935–39. After a 3-year postwar decline consumption leveled off at about 350 pounds. The postwar decline in per capita use has been much sharper for fluid cream. In the decade between the 1945 peak and 1955, the use of fluid cream dropped 26 percent, as compared with a 9 percent decline for milk.

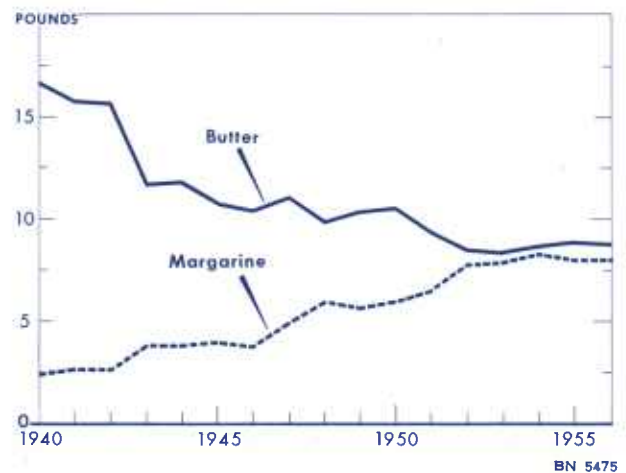


Fig. 6.—Per capita consumption of butter and margarine, 1940–56.

Utilization of Butter

Total production of butter in the United States began to decline in the mid 1930's, dropping sharply during the Second World War and has leveled off slightly below the war-end level. Butter now takes about 25 percent of the milk fat produced in the United States as compared with 45 percent in the 1930's.

Per capita consumption of butter has dropped nearly one-half from its peak in the 1930's and 7.9 pounds since 1940 (fig. 6), while consumption of margarine has more than doubled. During the latter part of the Second World War when the domestic supply of fats was short and some fats were rationed, consumers in certain areas demanded removal of restrictions against colored margarine. Between 1944 and 1953, the sale of yellow margarine was legalized in 26 States. Only Wisconsin and Minnesota now prohibit the sale of colored margarine. Also, the Federal excise tax of 10 cents a pound on yellow margarine was removed in 1950. Today combined consumption of butter and

margarine per capita is no greater than the consumption of butter alone in earlier years.

The price relationship between butter and margarine has undoubtedly been a strong factor in the shift in use of the two products. The price of margarine has given it a substantial advantage over butter, as shown in figure 7.

Utilization of Cheese

Eleven percent of the total milk supply was used for cheese in 1956. This was double the quantity used 25 years ago. The trend in cheese consumption per capita has been upward for the last half century, from about 4 pounds in 1910 to 6.3 just before the Second World War. Consumption dropped during the war and has since risen to a record high of 7.8 pounds in 1954, which has been continued through 1956 (fig. 8).

Although our exports of cheese before the Second World War were negligible, during the war they reached record levels as high as 29 percent of United States production. After the war exports of all dairy

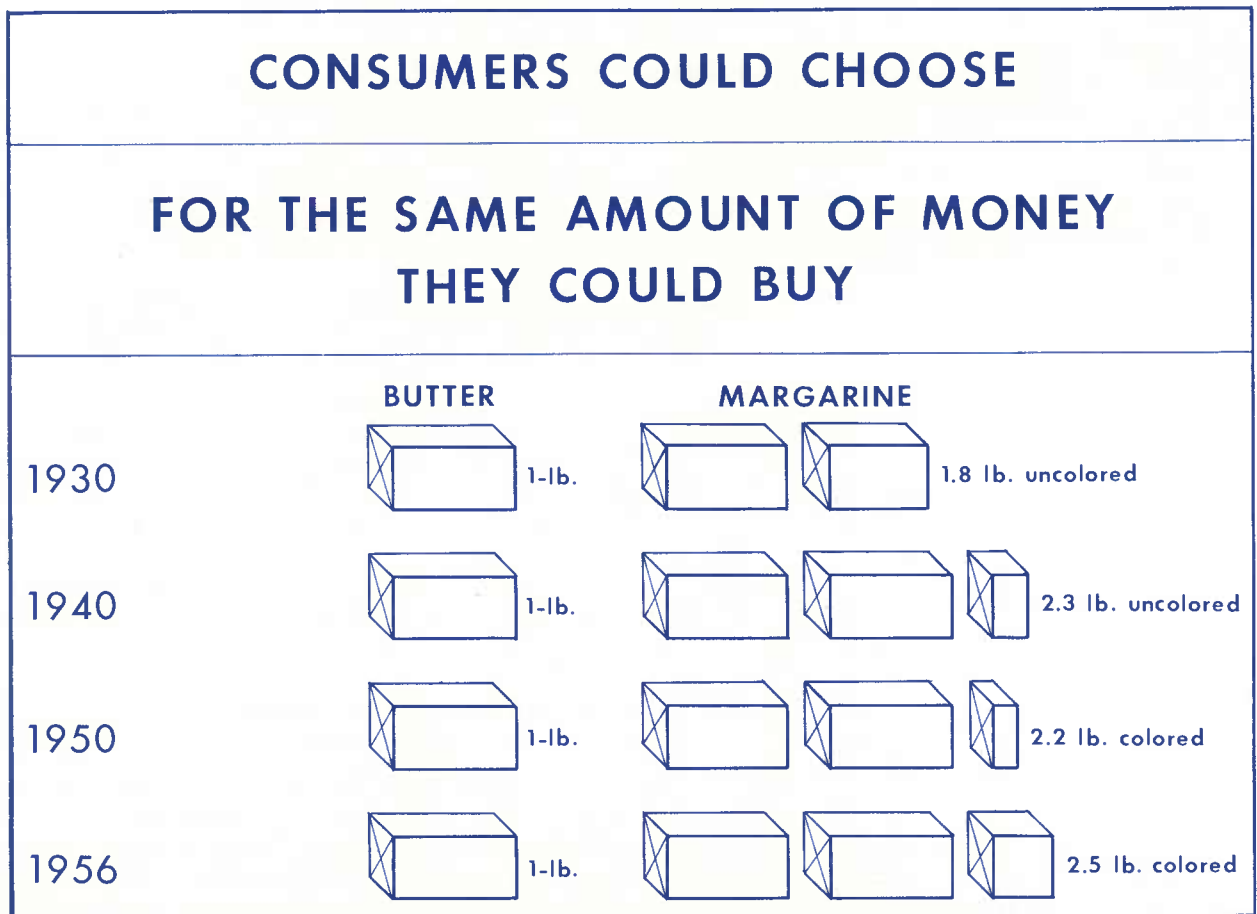


Figure 7.—Price relationship between butter and margarine for specified periods.

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Figure 8.—Per capita consumption of all cheese except cottage, 1940–56.

products dropped back to a low level (fig. 13, p. 13). Since the Second World War import restrictions on certain dairy products have been in effect (page 13), and imports have not exceeded the whole milk equivalent of 1 percent of our production during the last quarter century. During the period 1951–55 the average annual exports of cheese were 23.5 million pounds, as compared with average annual imports of 52 million pounds for the same period. Since 1954 our exports of cheese have been increased through Government programs aimed at developing foreign markets and through other programs directed toward reducing stocks held by the Commodity Credit Corporation.

A number of varieties of cheese are made in this country but the most important is the Cheddar type as shown in table 4.

TABLE 4.—Recent trends in cheese production by varieties

Kind	Percentage of United States production, 1956	Change in 1956 from—	
		1950–54	1955
		Percent	Percent
American ¹	72.2	+8	0
Swiss	8.7	+17	+3
Brick and Munster	3.5	+41	+14
Limburger . . . . .	.3	-20	-5
Cream	5.7	+13	+6
Neufchatel . . . . .	.7	+77	+69
Italian	6.7	+46	+9
Blue mold . . . . .	.7	+16	0
All other varieties	1.5	-8	0
Total, all cheese	100.0	+11	+2

¹ Whole milk cheese including Cheddar, Colby, Washed Curd, Jack, Monterey, and Granular.

Utilization of Frozen Dairy Products

Frozen dairy products utilized nearly 7 percent of the Nation's milk supply in 1956. This is double the proportion used in 1940. Higher postwar incomes, intensified merchandising, increased home freezer space, a wider variety of flavors and packages, and convenience in serving, have been incentives for increasing sales for home use. The many types of stores and the widespread development of drive-in type retail establishments, especially during the summer, have all contributed to the increased availability of frozen desserts. The increase in per capita consumption of frozen dairy products is shown in figure 9.

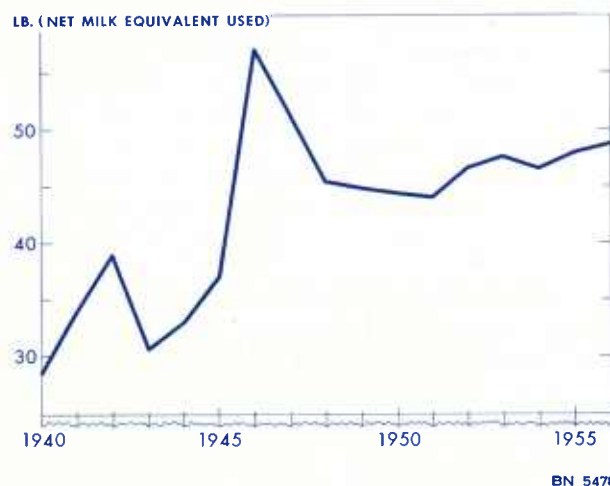


Figure 9.—Per capita consumption of frozen dairy products, 1940–56.

The present emphasis by many consumers on reducing the intake of fats has helped to stimulate the use of low-fat frozen desserts. The production of ice milk has increased more than tenfold since 1944. There has been a substantial increase in the number of establishments producing ice milk. For example, between 1954 and 1955 there was an increase of 1,700, mostly roadside stands. Other frozen dairy products include sherbet and soft-frozen products. Production of mellorine (made with fats and oils other than milk-fat) has tripled since 1952, and in 1956 was produced in 12 States as compared with only 4 in 1952.

Utilization of Evaporated, Condensed, and Dry Whole Milk

The three uses, evaporated, condensed, and dry whole milk, took slightly less than 6 percent of the total milk supply in 1956. This is about the same as for 1940; however, the proportion was greater during the war when about one-third of the evaporated and condensed milk and about three-fourths of the dry

whole milk was exported during the peak period. The trend in per capita use of evaporated milk which utilizes about 85 percent of the total milk going into these three uses is shown in figure 10.

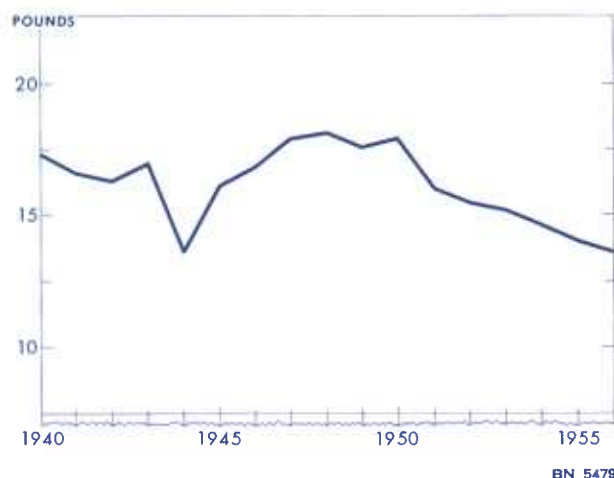


Figure 10.—Per capita consumption of evaporated milk, 1940–56.

Utilization of Nonfat Dry Milk Solids

On a solids-not-fat basis about 13 percent of the total milk supply was utilized for the manufacture of nonfat dry milk solids in 1956. The trend in total production of nonfat dry milk solids is shown in figure 11. Emphasis during the Second World War on in-

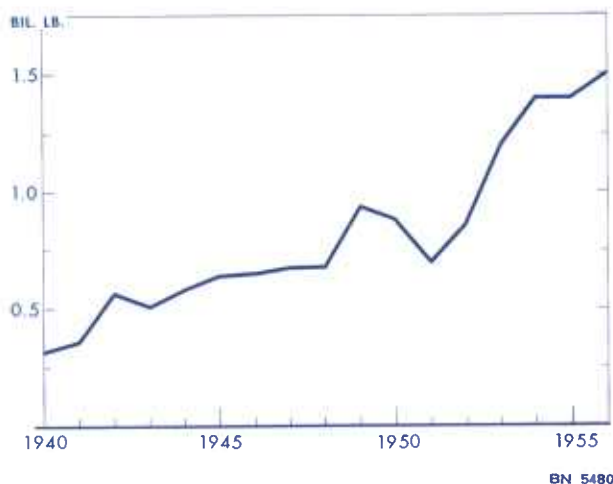


Figure 11.—United States production of nonfat dry milk solids, 1940–56.

creased production of nonfat dry milk for human use resulted in an estimated quarter million dairy farmers shifting from marketing farm separated cream to whole milk. Plant capacity for manufacturing nonfat dry milk increased 60 percent. More than half of the increase occurred in Minnesota and Wisconsin. National out-

put doubled during the war period, going from 322 million pounds in 1940 to 643 million pounds in 1946, yet civilian use during 1943–45 was less than before the war. The increase went to military and foreign uses. After the war, production continued to increase but foreign outlets took decreasing amounts, and domestic use did not increase as fast as production.

The trend of per capita consumption is shown in figure 12. During the period 1940–56 the rate of production of nonfat dry milk solids increased five-fold, while the rate of consumption only doubled. Most of the surplus production in excess of consumption was purchased by the Government. Purchases for price support operations during 1953–56 amounted to nearly half (46 percent) of the total production in the 4-year period.



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Although still small in relation to the total supplies of nonfat dry milk solids, commercial exports have risen from practically none before 1954 to more than 80 million pounds each year in 1955 and 1956, including substantial quantities sold at less than domestic support prices. Donations of nonfat dry milk solids to foreign countries were also substantial, 365 million pounds in 1955 and 400 million in 1956.

The increasing rate of production of nonfat dry milk solids as related to both domestic and foreign commercial outlets has contributed to the problem of surplus dairy products. Apparently the returns to producers from that portion of the milk supply used for nonfat dry milk solids at prevailing prices of recent years have been sufficient to bring about continued increase in production. The trend makes it of interest to consider what the potential production would be if all the milk-solids-not-fat that are still kept on farms as skim milk were made into nonfat dry milk solids.

We observed in figure 1 (p. 7) the pattern of how the total milk supply has been used, but the illustration does not give us a good perspective of the proportion of the total milk supply used for nonfat dry milk solids.



Figure 12.—Per capita consumption of nonfat dry milk solids, 1940-56.

In many dairy processing plants butter and nonfat dry milk solids are joint products. For that reason it appears that the major source of milk for nonfat dry milk solids comes from the same milk supply that furnishes part of the creamery butter supply. In 1956 the whole milk equivalent of the farm-separated cream was 13.8 billion pounds. If all the solids-not-fat in that portion of the milk supply had been made into nonfat dry milk solids it would have amounted to 1 billion pounds in addition to the 1.5 billion pounds of actual production.

Commercial Uses of Nonfat Dry Milk

Major commercial uses of nonfat dry milk solids are shown in table 5. Note that home use of nonfat dry milk solids has risen from a low-use category in 1948 to third place in 1956, that use in dry mixes has tripled during recent years, and use in dairies has doubled. Although total commercial use has nearly doubled since 1948, because production has

been increasing at a faster rate the proportion of total production used commercially has fallen in recent years.

Foreign Trade in Dairy Products

The United States leads the world in the volume of milk produced. In 1956 it produced nearly 126 billion pounds, or more than the combined milk production of the next four leading countries. Other countries that lead in the production of milk are: France, Republic of Germany, United Kingdom, Italy, Canada, Australia, Netherlands, New Zealand, and Denmark, in that order, based on estimated production in 1956.

Except during wartime or more recently because of special governmental programs, foreign trade in dairy products by the United States has historically been only a small part of the domestic production. During much of the time in the last quarter century United States foreign trade in dairy products has been less than 1 percent, when measured in terms of whole milk equivalent (fig. 13).

Exports

Exceptions to the historical pattern occurred during and following both the First and Second World Wars when large quantities of dairy products, particularly cheese and processed milks moved abroad. However, even at the peak of the movement during the Second World War in 1944, only the equivalent of about 6 percent of total domestic production was exported. Peacetime shipments abroad increased to approximately 5 percent in 1956 under the stimulus of special governmental programs. The five most important products exported during 1951-55 were as follows (with their share of total value of all dairy products exported): Dry whole milk, 27 percent;

TABLE 5.—Domestic nongovernment use of nonfat dry milk solids, 1948-56

Use	1948	1949	1950	1951	1952	1953	1954	1955	1956
Millions of pounds									
Bakery.....	306	282	292	262	275	263	276	299	272
Dairy.....	89	100	106	149	160	126	146	184	163
Meat processing.....	36	34	58	59	88	64	68	81	84
Packaged for home use.....	2	6	30	59	85	96	142	137	154
Prepared dry mixes.....	15	13	20	19	30	42	48	50	37
Confectionery.....	11	6	10	17	15	12	17	15	16
All other uses.....	18	24	34	29	37	23	22	27	21
Total domestic nongovernment use.....	477	465	550	594	690	626	719	793	747
Percentage of total production in nongovernment uses.....	70	50	62	85	80	52	51	56	50

Annual Census of Dry Milk Distribution and Production Trends, The American Dry Milk Institute, Inc., Chicago, Ill.

evaporated milk, 23 percent; nonfat dry milk, 16 percent; cheese, 9 percent; and butter, 3 percent.

Imports

For the years 1953-55 more than 95 percent of the total value of dairy imports was represented in cheese and casein. Cheese made about two-thirds and casein one-third of that share. Because of the difference between the United States price and world prices of dairy products, the duties charged on imports have in many cases not been very effective in restricting shipments into this country. Imports of most dairy products by the United States have been limited by quotas for the different dairy products. For fiscal year 1956 import quotas of fixed quantities were in effect for butter, malted milk, nonfat dry milk, Italian cows' milk cheese, Cheddar, Edam, Gouda, Blue Mold, dry whole milk, dry buttermilk, dried cream. More recently butter oil and butter substitutes have been placed under quota. Restrictions established during the Second World War have been lifted on casein, Pecorine and Roquefort (variety cheeses made from sheep's milk), Swiss, Gruyere process, Bryndza, Goya, and Stilton cheese.



Figure 13.—Comparison of U. S. exports and imports with production, 1925-56. (Whole milk equivalent.)

Adjustments in the Dairy Industry Due to Technological Developments

In the introduction it was indicated that change might well be the mark of progress. Although we have witnessed a century of far-reaching changes in the dairy industry we still seem to be in the midst of many.

Adjustments in Production

The need for adjusting to changing conditions is not new for dairy farmers. In an effort to produce

milk more efficiently, one of the adjustments dairymen have made is to increase the size of the dairy enterprise. Improved arrangement of work space and work methods have permitted the increase in size of herd without additional labor requirements and even a possible reduction. The feed supply for the enlarged herd may come from the same acreage but with improved cropping and pasture practices and from new crop varieties, the use of fertilizer, and improved methods of management.

Among other technological developments artificial breeding has made its contribution in at least two ways. Its major contribution was to step up production in next generation animals through the use of better sires and at the same time permitting wider influence than when limited to a single herd. Also it released barn space which on many farms is now being used for additional milk cows. Contributions to work load and methods have come from such developments as loose housing, parlor milking, pipelines that can be cleaned in place, barn cleaners, mechanical feeders, and field choppers. The new insecticides for control of flies and other pests have contributed through greater comfort to animals and reducing opportunities for contamination and spread of disease. Improvements in refrigeration together with availability of electricity have done much to improve the quality of milk.

Bulk handling of milk has reduced labor and in many instances improved quality. Producer-dealer relations may also have been improved, because farmers like selling milk on the basis of quantity and test at the farm. When complete conversion is possible in an area, the receiving operation at the plant may be greatly reduced, and much of the equipment, such as scales, can washer, conveyor, and some labor, can be done away with. With bulk handling these functions have merely been moved to the farm. Some of the disadvantages of bulk handling are the heavy initial investment by producers, the increased costs during the changeover, resulting from a dual system of both can and bulk, and more responsibility on the truck driver for measuring milk, rejecting it if necessary, and taking a sample.

Adjustments in Processing

A similar adjustment by the manufacturing segment of the dairy industry parallels the increase in size of the dairy enterprise on farms. The number of plants manufacturing dairy products has substantially declined, and at the same time output per plant has increased (table 6). These changes in the number of

plants have resulted from: (1) Improvements in transportation; (2) fuller use of plant capacity; and (3) replacement of small plants with large plants.

TABLE 6.—Changes in number and output of plants in United States manufacturing dairy products between 1940 and 1955.

Product manufactured	Number of plants	Average volume per plant
	<i>Percent</i>	<i>Percent</i>
Butter.....	-49	+51
American cheese.....	-43	+187
Evaporated milk.....	-34	+58
Nonfat dry milk solids.....	+69	+159

Source: Dairy Statistics Branch, Agricultural Estimates Division, Agricultural Marketing Service, U. S. Department of Agriculture.

The opportunity to reduce costs of operation by increasing the output of a plant up to the level at which unit costs are at a minimum provides a strong incentive for attempting to draw milk and cream from rival plants. Furthermore, firms that own more than one plant, often find it profitable to discontinue production in certain plants. Generally the plants that close are among the smaller ones. Many firms that operated small plants replaced them with a single large plant.

Some of the advantages of larger plants are: (1) Increased output per man; (2) generally in a position to employ a more competent manager; (3) generally easier to standardize and improve products; and (4) possible utilization of byproducts more efficiently. These advantages are probably offset to some extent by higher costs of hauling milk and cream.

In addition to changes in size and number of plants an important change has taken place through new and improved processing equipment, improvements in handling materials within plants, packaging, plant management and personnel management, laboratory controls of product quality, and many similar developments. In many plants the receipt of bulk milk has eliminated completely the can conveyor, can receiving room, can washer, and other space and equipment no longer needed as well as the labor required to operate it.

Adjustments in Milk Distribution

Distribution of a bulky perishable product like milk is a relatively costly operation. Efforts to reduce this cost have included a shift from daily delivery to homes

to a general practice of every other day delivery or even less frequent. In some markets the distribution through stores now makes up 80 percent or more of total market sales. Other innovations have been changes in containers, bulk dispensing, automatic vendors, and concentration of the product.

Paper cartons.—The paper carton for milk has revolutionized milk distribution. Where formerly the area in which a distributor operated was small, it is now possible to transport larger loads of milk long distances at lower unit costs. This is possible in part because of two factors, the lighter weight of the containers as compared with glass bottles, and the elimination of handling returned empty bottles. Resulting economies have made it possible to extend marketing areas. Some milk in paper cartons now travel several hundred miles before it reaches the consumer. A larger volume operation is necessary to cover additional plant



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expenses involved in paper packaging. Many small distributors have given up their bottling operation because they did not have the necessary capital or sufficient volume to warrant converting to a paper bottling operation.

Gallon jugs.—Use of the gallon jug has been adopted in a number of markets in an effort to reduce milk prices and increase consumption.

Bulk milk dispensers.—Bulk milk dispensers have increased as a means of distributing milk in eating places, institutions, and for in-plant feeding such as company- or employee-owned cafeterias. Some users report increased sales, better milk flavor, less refuse from cartons, or elimination of empty bottles. Some of the other considerations are health requirements



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relating to their use, the size of glass used for serving—one too small results in spilling; one too large gives the consumer the idea of “being shorted.” Some milk distributors have been reluctant to service bulk dispensers because of the nuisance at first when volume was small and considerable extra cost and effort were involved.

Milk vending machines.—Milk vending machines have increased rapidly. There are three main types, coin operated, that vend milk in a closed container. (1) A vendor of small units (half pint, third pint, or pint) for immediate consumption may be found in such places as factories, office buildings, schools, military installations, hospitals, and transportation terminals. (2) An apartment house type that vends quarts for taking home has been introduced in densely populated areas where there may be up to 100 families in one building. (3) Outdoor milk vending stations are designed for cash and “carry home” use and can vend half-gallon paper cartons of milk as well as quart size.

Some of the advantages reported for vending machines: Lower milk prices where price differentials under home delivery are not prohibited; 24-hour service, which leads to impulse sales—particularly through the small-unit type for immediate consumption; reduction of distribution costs; elimination of credit accounts and collection problems with consumers. A disadvantage as compared with the vending of some products is the perishability of milk. A vending machine must be serviced frequently enough to insure that only fresh milk is vended.

Concentrated milk.—In 1951 there was a widespread development in a number of markets of removing sufficient water from milk to reduce the volume to about one-third. Among the factors contributing to this development were efforts to reduce transportation cost, reduce storage space, and package costs. Experience proved the possibility of realizing these objectives. However, several offsetting factors hindered the adoption of this method of marketing milk. The main reason was the lack of sufficient saving to the consumer to compensate for the bother of recombining the concentrated milk with water. In most markets the price was nearly the same as for fresh fluid milk. Another problem was that of satisfactory water to add to the concentrate. Where water was treated with chemicals the taste often carried over into the recombined milk. Also in hot weather the space in the home refrigerator saved by the concentrate was often used to chill water to add to the concentrate.

Efforts to develop a market for concentrated milk still continue in some markets. Distribution of concentrated milk to farm people was started at Iowa State College in 1951 on an experimental basis. Five routes were established. Each one extends about 100 miles and serves 75 farm customers once a week with concentrated milk, ice cream, cottage cheese, and several other dairy items.

Dry milk in consumer packages.—An important development of the dairy industry since the war has been the increased emphasis on packaged nonfat dry milk for home use. Utilization for this purpose has increased many times (table 5, p. 12).



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PART 2. PRICING IN THE DAIRY INDUSTRY

In our free enterprise economy, economic forces operate through the pricing system and thus guide production and use of goods and services.

The Pricing System Resembles the Nervous System

It is difficult to find a good analogy for the pricing system as it operates in a free economy. Our pricing system resembles the governor on a tractor or a thermostat in a house, but these regulators always produce a positive mechanical action. We need an example that will illustrate a range of responses—from an immediate response to a delayed response or none at all. The nervous system in our bodies comes close to illustrating how our pricing system works.

When a part of the body is stimulated a message is carried through the nervous system to the brain for a decision. Likewise in a free enterprise economy the price mechanism provides the media for transmitting economic stimuli to people that influence them to make decisions. The decisions may be to produce more, less, or the same; or to raise or lower the selling price or leave it unchanged. The same factors that cause one person to decide on a particular action may cause another to decide to do just the opposite. This possibility of opposite responses to the same situation which appears to be similar makes it difficult to understand our economy.

Although these analogies are imperfect they help us to better understand the influences of supply and demand. Supply and demand are important in the development of "principles" in economic theory. These principles serve as guides in economic analysis.

Economic Principles Help Tell Us What to Expect

The pricing of milk for fluid use is complicated. But that need not prevent us from understanding it. In many respects we live in a complicated world and our generation understands and takes for granted many things that were unheard of by our parents.

Pricing comes under the study of economics which is a social science, that is, it deals with people in contrast to a physical science which deals with things. Physical science tells us that raising the temperature of a particular metal a given number of degrees will

cause a certain amount of expansion. This will always be so. In a social science we learn that people have a tendency to react in a certain way to a given situation but we can't expect a definite fixed response every time. There are some who just don't respond in the usual or expected manner.

In order to develop some principles which can be used in understanding pricing, economists have developed what is called a schedule of supply and a schedule of demand. They are simply lists of various amounts of items people will sell or buy at different prices. The schedules are based on the normal or usual expectation of people's response. Studies of certain items in selected markets for specified time periods have given quite reliable measures of expectation. From this information schedules of supply and demand have been developed. Of course, people in the market do not actually draw up schedules of this kind. Nevertheless even though the schedules are assumed, they make it easier to understand what takes place in the determination of price.

For example, let's assume a small town where customers are willing to buy the following quantities of milk at different prices. This is their demand schedule.

<i>Quarts customers are willing to buy</i>		<i>Cents</i>
94	-----	34
98	-----	28
102	-----	22
106	-----	16

Assume also that dairymen near this small town are willing to sell the following quantities of milk at different prices. This is their supply schedule.

<i>Quarts farmers are willing to sell</i>		<i>Cents</i>
106	-----	34
102	-----	28
98	-----	22
94	-----	16

Now how do these two groups of people establish a price? If we examine the two schedules we find that somewhere between 22 and 28 cents, the market could be cleared. By clearing it is meant that at a particular price, all the milk offered at that price would be sold. Figure 17 shows this to be 25 cents per quart for a quantity of 100 quarts. This is often called the equilibrium price. It is the point where supply and demand are equal. Most prices hover around this point, because there is a tendency for prices to move toward

equilibrium. With a higher price, buyers would refuse to buy as many quarts as are offered for sale at that price; if prices were lower, sellers would refuse to place as many quarts on the market as people are willing to take at that price. This assumes that farmers vary their sales according to price. But the perishability of milk causes a farmer to sell all his milk on any given day. However a supply schedule of the type described would exist when time is allowed for dairymen to adjust production. The nature of the dairy business makes it possible for consumers to decrease purchases abruptly, but production adjustments are usually slow.

It should be kept in mind that the supply and demand schedules are a useful description only for a particular time and place. Over a period of time buyers and sellers may develop an entirely new set of price-quantity relationships.

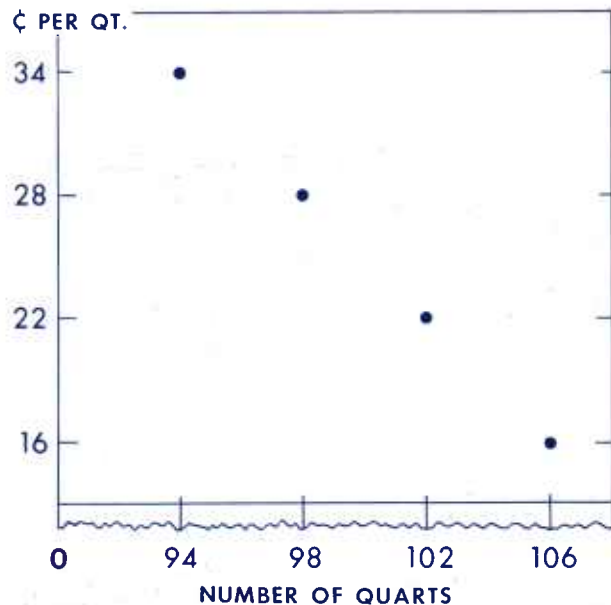
To sum up these statements for a "rule of thumb" guide we can express them another way:

A rising price encourages production but discourages consumption.

A falling price discourages production but encourages consumption.

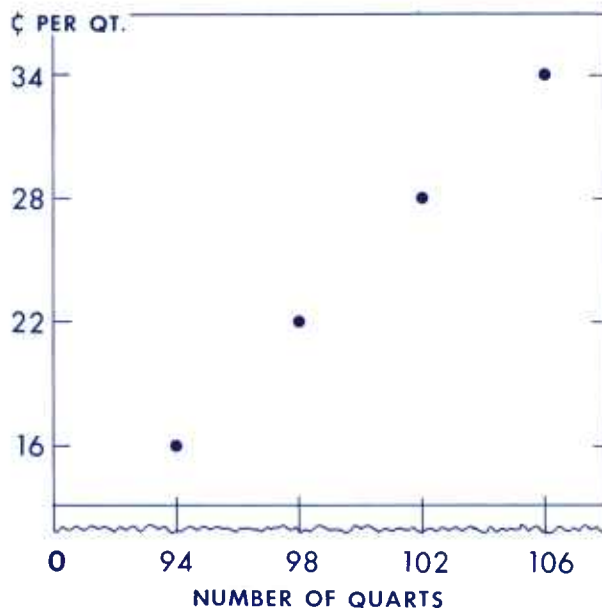
These observations are based on the fact that it is just human nature for sellers to want a high price and buyers to want a low price.

The following examples will illustrate price determination graphically. Suppose we put on a chart the amounts people will buy as shown on the demand



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Figure 14.—Amount of milk that would be purchased at different prices.

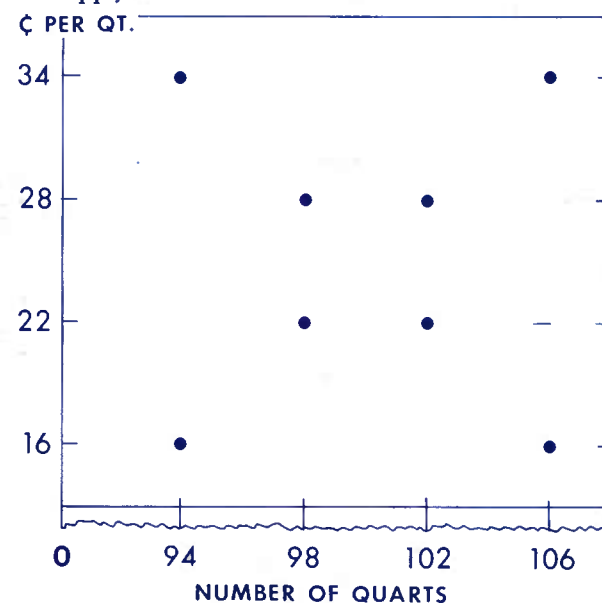


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Figure 15.—Amount of milk that would be sold at different prices.

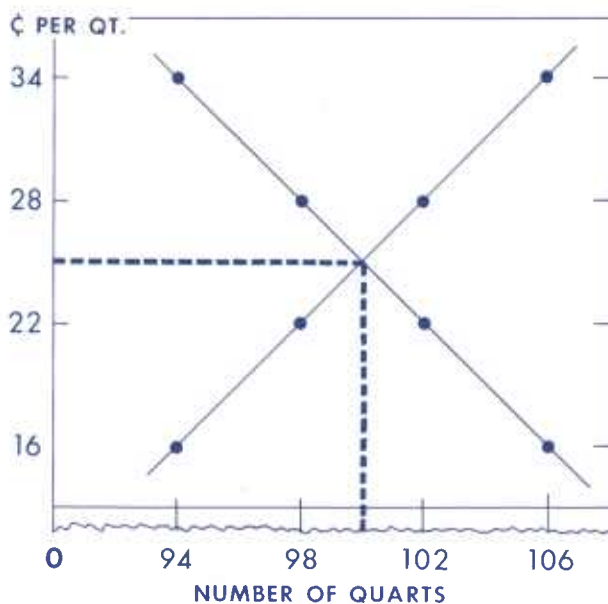
schedule. This gives us the picture as shown in figure 14. Then when we do the same thing for the amounts dairymen will sell, as taken from the supply schedule, we get the picture shown in figure 15.

If we put both schedules on the same chart we get the information shown in figure 16. Next we can draw a line through the points representing quantities and prices. Then drop a vertical line from the point where the supply and demand curves intersect. It falls on



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Figure 16.—The amount of milk that would be purchased and sold at different prices.



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Figure 17.—The equilibrium price and quantity of milk purchased and sold in a hypothetical market.

100 quarts which would be the quantity of milk bought and sold. A line drawn horizontally from the intersection hits the 25-cent point and indicates the equilibrium price shown in figure 17.

Competition in a Free Enterprise Economy

If all the tendencies just described worked perfectly under our capitalistic system, the result would be complete economic equilibrium on the basis of price relationships. In practice, however, there are many obstacles to the attainment of full equilibrium. Competition is an important element in the system. It is what keeps buyers and sellers "on their toes."

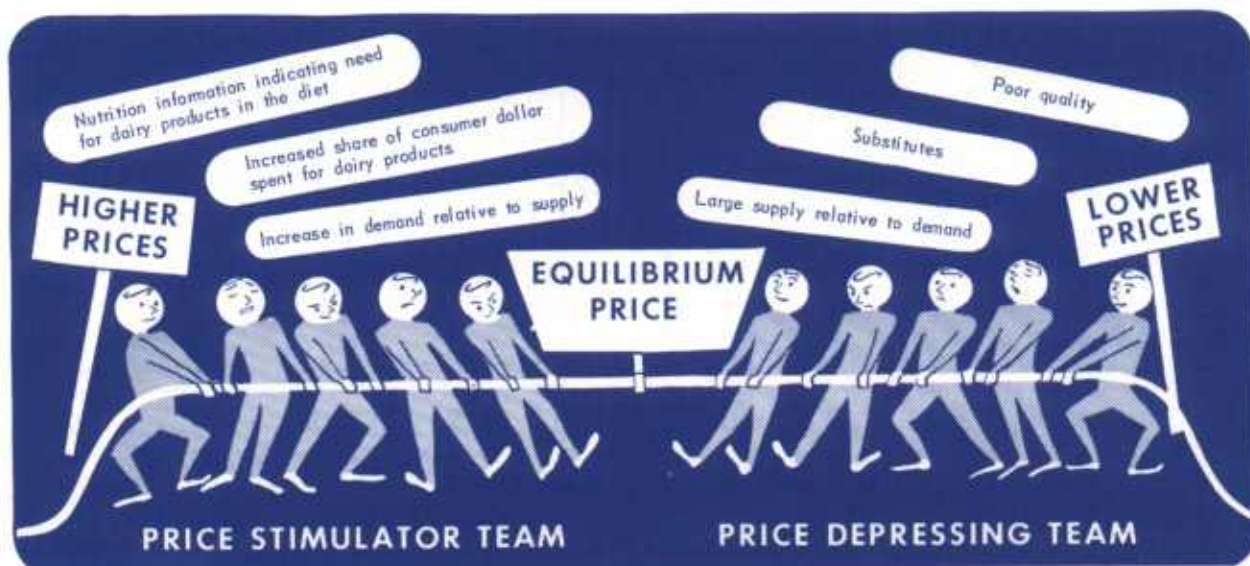
In theory "perfect competition" exists when the following conditions are present: (1) There are enough buyers and sellers so that the action of any one alone has no perceptible influence in the market; (2) the product exchanged is homogenous, that is, one unit is interchangeable with all other units of the same description; (3) there is complete knowledge on the part of all buyers and sellers, that is, with respect to quantity, quality, location, prices in other markets, and other facts that would be useful in bargaining; and (4) there is mobility of resources, that is, dairymen can shift to grain farming or beef cattle or other uses of their land, labor and capital.

Seldom do we find conditions in milk marketing that fit this description of perfect competition. There are many producers and few handlers and processors. Trade barriers exist. There is lack of complete information about prices. But even these recognized imperfections do not remove the basic workings of supply and demand in the determination of price.

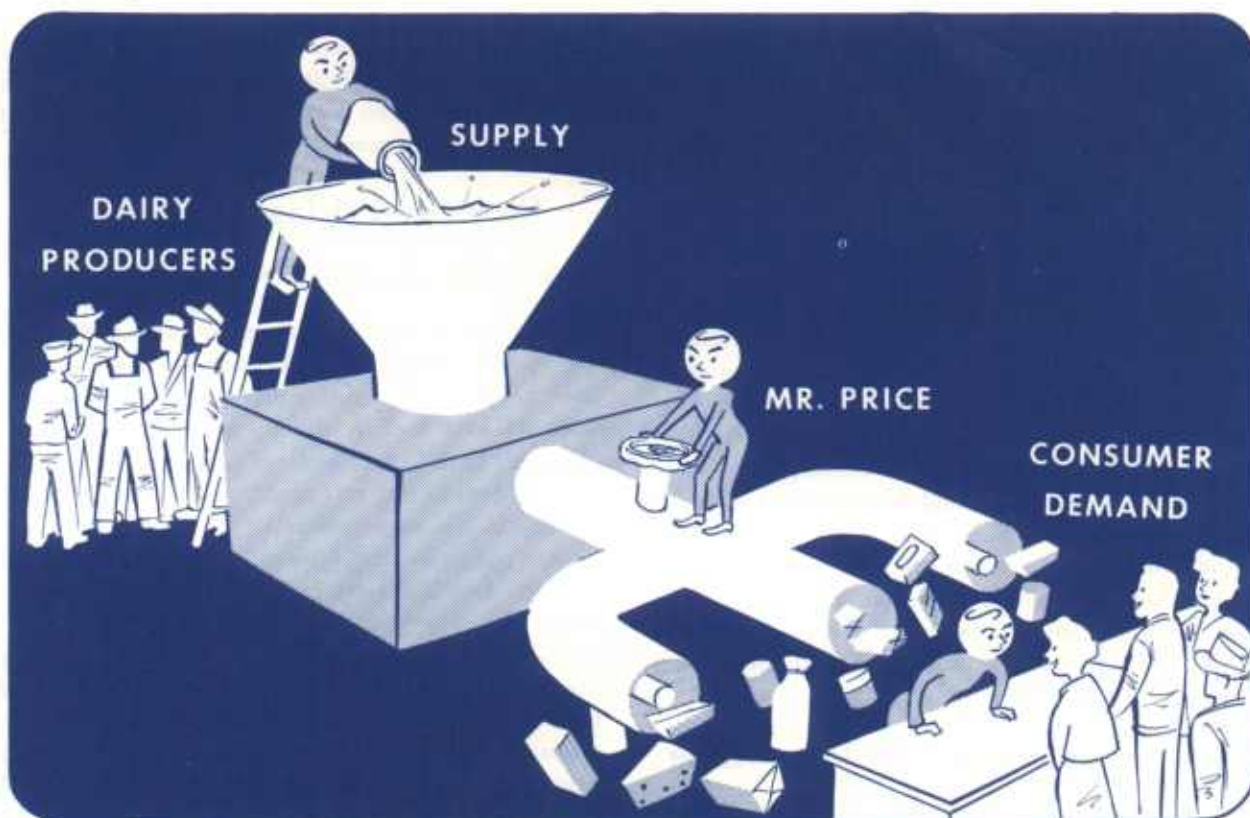
Developments in the Procedure for Milk Price Determination

We may feel that the laws of supply and demand do not work under modern marketing conditions. An individual producer may feel that he has no influence on price determination—likewise an individual consumer may feel the same way. Yet when we look behind the complex marketing mechanism that exists today, we see the influences of the sum total of the individual actions that have just been described.

When producers sold milk directly to consumers it was easy for them to communicate. If the consumer did not like the quality or the price it was easy to tell the producer. But producers and consumers became



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separated when the distribution function became more specialized and was handled by milk dealers. This made it more difficult for producers and consumers to communicate with each other. The communication process has been made still more difficult through such developments as sanitary requirements, formula pricing, price fixing by States, minimum pricing under a Federal order, and the hearing procedure. However, none of these have changed human nature from producers wanting a high price and consumers a low price. But the ways in which they can express these desires have gone through great change.

Instead of individual producers and consumers deciding on the quality of milk for each transaction it has been determined by group action and expressed through some level of government and all producers and consumers in a market use the same minimum standard.

Formula pricing has been developed to reflect the conditions that exist in a market. The conditions which the formula is designed to reflect are the result of a large group of individual supply and demand schedules expressed collectively, either in a specific market or nationally. The Department Store Sales Index would be an example of collective consumer demand schedules for purchases made in department stores.

Under collective bargaining producers try to do as a group what the individual producer formerly did directly with his consuming customer. Instead of dealing with the consumers as a group the producer group deals with an intermediary group, the milk dealers. But the dealers are conscious of the sum total of consumer demand schedules. If sales of milk drop or increase on a route with the same customers and no change in price, the dealer knows that a change has taken place in their demand schedules.

The hearing process is another modification of the bargaining process. It provides for a particular level of government to participate in the price making process as an observer or umpire to represent the public interest. But neither does this change the influences based on human nature that are the bases for the laws of supply and demand. It is a further modification of the rules that have been developed for determining milk prices.

Producer Responses to Price Affect Supply

The price may be high enough that certain producers will decide to increase their production. This of course affects supply. But it may take a long time

for a dairyman to actually place additional quantities of milk on the market. He may be able to get a limited increase in a short period by heavier feeding, better pasture, reduced culling or by purchasing additional cows.

The purchase of additional cows would increase production for the purchaser, but would decrease production for the seller. Thus a transfer of this kind would not affect total farm milk output. However, it might affect the amount in a particular market if cows were sold from one market to another. On the other hand, if the dairyman decided to expand by keeping more heifer calves, it could take up to 2 years to be selling milk from a calf born this morning.

Reducing production could be accomplished much faster—he could sell some cows, feed them less, or could sell out completely in a relatively short time. If he sells to other producers he has merely transferred ownership of productive resources. If he sells his herd for slaughter then production has unquestionably been stopped!

Consumer Responses to Price Affect Demand

Consumers have many choices in how to spend their money. The amount spent for milk and its products affects the demand. Changes in the price have less effect on fluid milk purchases than on manufactured dairy products. In the case of manufactured products there is more opportunity for substitution—cheese competes with other protein foods, butter with other fats and spreads, ice cream with other desserts.

Consumption is affected by retail prices. However, because retail prices of milk are often associated with changes in other economic conditions and seasons of the year, it has been difficult to isolate and measure the effects of price upon per capita rates of milk consumption.

It takes a relatively large change in price to have much effect on the amount of milk consumed. When a large change in price is required to bring a small change in demand we have what is known as “inelastic” demand. Most individual agricultural products have inelastic demand.

For fluid milk, studies show that with a 10 percent change in the retail price, a change of about 3 to 4 percent in the opposite direction can be expected in purchases. The demand for milk is more elastic for low-income families than for high-income families.

We must recognize that most studies refer to a particular market and cover a relatively short period of

time. Consumers are usually slow to change their food habits. Knowledge is limited about the response which consumers make after a given price has been in effect for months or even years.

Classified Pricing and Pooling

Pricing Milk According to Use

Regardless of whether market milk is sold for fluid use or for manufacturing, farmers usually sell it by some prearranged pricing procedure. In general, milk does not lend itself to dealing on an “offer and acceptance” basis. Administered pricing by State milk control agencies and/or Federal milk marketing orders is important in many markets. Negotiations between dealers and individual farmers are practiced in small markets; in other markets farmer cooperatives negotiate with handlers for the price.

Classified pricing of milk is an outgrowth of early experiences. This method of pricing was first started by a few cooperatives in the early 1900's. This contrasts with the “flat price” method where a single price was announced by the handler. All milk received from a producer was paid for at a uniform rate. Allowance was usually made for manufacturing use by keeping the price low enough to compensate for the lower value use.

Classified Pricing

Classified pricing of milk simply means pricing according to use—one price for the proportion used as bottled milk, and another for the part used in manufactured dairy products. Class I milk is almost exclusively distributed and consumed as fresh fluid milk, including milk drinks. It usually brings a higher price, substantially above the Class II price. Milk used in various manufactured products is usually classified as Class II. Prices for Class II milk are based on various measures of value of milk for manufactured purposes. Some markets have more than two classes.

Factors which gave rise to classified pricing of milk include perishability, sanitary requirements, bulkiness, and the seasonality of production. The value of these factors is greater for fluid use than for manufacturing use. The demand for most fluid milk products is quite separate from the demand for manufactured products. Sales of fluid milk are fairly even the year around, while production is seasonally higher in the spring than in the fall. Seasonal surpluses of milk must be diverted into manufactured dairy products at lower returns.

Rigid sanitary measures must be maintained to insure purity and reduce perishability of fluid milk. Costs may be lower in the production of milk intended only for manufacturing. The processing of manufactured products destroys bacteria and reduces the need for sanitary requirements as strict as for fluid milk.

Bulkiness is reduced in the manufacture of dairy products, but fluid milk is as bulky when delivered to the consumer as when it leaves the milking machine. This means that transportation costs will be higher for fluid milk than for the more concentrated manufactured products as shown in table 7.

TABLE 7.—*Costs of shipping products made from 100 pounds of milk to New York City from Shawano, Wis., March 1954.*

Products	Freight cost per 100 pounds of milk equivalent to New York City from Shawano, Wis.
Fluid milk (in tank cars).....	\$1. 600
Evaporated milk (in cases of 48 tall cans).....	. 486
American cheese.....	. 133
Dried skim milk.....	. 087
Butter.....	. 058

Source: Milk Control Programs in the Northeastern States, Part I, by Leland Spencer and S. Kent Christianson, Bulletin 909, Cornell University Agricultural Experiment Station, Ithaca, N. Y. November 1954, p. 37.

Pricing Milk for Fluid Use

Under classified pricing the procedure for determining the price of milk for fluid use varies between markets. The general principle to keep in mind is the use of a base figure with provision for adjusting it.

Some markets use as a base the price of fluid milk at some time in the past when it was considered to reflect fairly accurately a balance between supply and demand. Usually a formula is used to adjust this base figure to reflect present market conditions in establishing the current price for fluid milk.

In other markets the base figure is the price of manufacturing milk. Because manufactured products compete for the national market, their prices are considered to more accurately reflect influences of supply and demand in the market. Then a differential is added to the manufacturing milk price that is generally considered necessary to attract a sufficient quantity of

milk for fluid use to satisfy the demand in the market. The differential to be added to the base figure may be calculated by formula, or arrived at by negotiation or hearing.

Pricing Milk for Manufacturing Purposes

Because manufactured dairy products are not as perishable as fluid milk most of them can be sold on an "offer and acceptance" basis. This permits the forces of competition to operate much more freely. Where competition exists it generally assures that the price of a product will stay in line with the costs involved. The butter market is a good example. If the New York butter price exceeds the Chicago price by more than the cost of moving the butter, traders will move the product from Chicago to New York. Because manufactured products compete nationwide, milk going into these products must be priced so they can compete with similar products from other areas.

Competition between products operates in the same way. Milk used in manufactured products can be shifted from one use to another. Dairy plant managers can make this shift within a diversified plant, or milk can be shifted between plants making different products. Note that in 1956, the average price per pound of milk fat for the uses shown in table 8 fluctuated within a narrow range.

TABLE 8.—*Average United States prices paid producers for each pound of milk fat used by manufacturing plants in specified dairy products in 1956.*

Month	Butter and by-products	Evaporated milk	All cheese	American cheese	Swiss cheese
	Dollars				
January.....	. 84	. 84	. 84	. 83	. 87
February.....	. 84	. 84	. 84	. 83	. 87
March.....	. 84	. 83	. 83	. 82	. 87
April.....	. 84	. 83	. 84	. 83	. 87
May.....	. 84	. 82	. 84	. 83	. 89
June.....	. 85	. 83	. 84	. 83	. 89
July.....	. 85	. 82	. 84	. 83	. 89
August.....	. 85	. 82	. 84	. 83	. 89
September.....	. 85	. 83	. 84	. 83	. 90
October.....	. 86	. 84	. 85	. 84	. 89
November.....	. 88	. 86	. 86	. 84	. 90
December.....	. 87	. 87	. 87	. 85	. 90

If demand for one of the manufactured dairy products increased enough to enable a manufacturer to raise his selling price, he would be able to increase his paying price to producers enough to induce some of them to shift their sales to him from other buyers.

This opportunity for producers to shift sales of milk between buyers for different uses according to prices received keeps prices of milk for different uses in equilibrium.

Price supports.—Although a price support program does not prevent prices from going above the announced level, its purpose is to prevent prices from going below that level. Under the program as it operated in 1956, prices to producers of butterfat in farm separated cream and manufacturing milk were supported. The support was accomplished by removing, in the form of butter, Cheddar cheese and nonfat dry milk, the milk which could not be sold commercially at prices corresponding to the support level.

Under this type of program the general levels of prices of milk and butterfat are supported but not necessarily every transaction. The prices paid in particular areas or by particular plants are also influenced by such factors as location, quality, use, and competition. The program does not change this situation. Although returns to individual producers are partly determined by these and other factors, this type of program continues to support the general levels of prices at the announced levels.

The price support programs bring into the market place an additional type of buyer—the Government—a potential buyer with relatively unlimited financial resources. This additional buyer stands ready to give assistance to producers through prices that are announced in advance. The objective of this buyer, unlike that of commercial buyers, is to stabilize prices received by farmers rather than make a profit.

Pooling of Milk

Classified pricing plans indicate the prices handlers will pay for milk going into the various uses. Pooling is a method of determining how these funds will be distributed among producers supplying the milk. Farmers receive a blend or uniform price when milk is pooled. The two methods of pooling returns to producers that are commonly used are (1) the individual handler pool, and (2) the marketwide pool.

When the individual handler pool is used each

handler pays his producers in accordance to the way in which he utilizes the milk for the various products. The handler whose milk goes principally for Class I use will pay a higher blend price than handlers using a large proportion for Class II or manufactured uses.

Here is an example of how two handlers arrive at a blend price under an individual handler system:

Dealer A

Use classification	Price per cwt.	Quantity cwt.	Class values
Class I (milk for fluid use)	\$5. 00	800	\$4, 000
Class II (milk for manufacturing)	3. 00	200	600
Total		1, 000	\$4, 600
Blend or uniform price		$\frac{\$4,600}{1,000} = \4.60	

Dealer B

Use classification	Price per cwt.	Quantity cwt.	Class values
Class I (milk for fluid use)	\$5. 00	500	\$2, 500
Class II (milk for manufacturing)	3. 00	500	1, 500
Total		1, 000	\$4, 000
Blend or uniform price		$\frac{\$4,000}{1,000} = \4.00	

In the illustration dealer A paid \$4.60 per hundred-weight to his producers, dealer B paid \$4.00 to his. In practice there would be allowances for butterfat and other specified differentials. Note that each handler paid a blend price in accordance to the use made of the milk.

Under a marketwide pool all the producers within the market would have received the same uniform price. If the two handlers used in the illustrations above had been the only two handlers in a marketwide pool, the blend price would have been figured for all the producers shipping into the market as shown below:

Use classification	Price per cwt.		Quantity cwt.	Class values
Class I (milk for fluid use)	\$5. 00	Dealer A	800	\$4, 000
		Dealer B	500	2, 500
Class II (milk for manufacturing)	3. 00	Dealer A	200	600
		Dealer B	500	1, 500
Total			2, 000	8, 600
Blend or uniform price		$\frac{8,600}{2,000 \text{ cwt.}} = \4.30		

Equalization Fund

Each handler would pay his producers the uniform price of \$4.30. Dealer A in the marketwide pool actually utilized milk valued at \$4,600. His total payments to producers at the uniform price were \$4,300. He turns the excess \$300 into an equalization fund.

Meanwhile handler B also pays his producers \$4,300. This is \$300 in excess of the value of milk he used. The \$300 excess paid into the equalization fund by dealer A is used to offset the \$300 deficit created by dealer B.

Under both types of pools the total value of milk in the market was \$8,600. If a marketwide pool had been used all producers would have received a calculated blend price of \$4.30. If the individual handler pool had been used one group of producers would have received a price of \$4.60 and another group \$4.00.

As in the case of farmers selling to manufacturing plants (page 21), farmers would also try to shift sales among dealers if prices paid by them were substantially different.

For example, under the method of pooling just described for a marketwide pool, all producers receive the average market price for all their milk regardless of the amount and needs of the market. Excess milk beyond the requirements for fluid use brings a lower price. An increasing amount of excess milk at a lower price when blended with the fluid price pulls down the average (blend) price in a market. Since all producers receive the same price under marketwide pooling there is no penalty for additional contributions to the surplus other than a slight price reduction which is shared by all producers.

The blend price may induce producers already in the market to increase their production even though they would not do so if they could get only the manufacturing price. Furthermore, the blend price may be high enough to induce producers to shift from manufacturing outlets. This brings about a further excess of milk supplies.

Seasonal and Base Rating Plans

In the introduction to this discussion on pricing it was pointed out that prices guide production and use of goods and services. This assumes that prices are free to signal through the pricing system when too much or too little of a product is being placed on the market. When the system is modified for various reasons sometimes the result may not be exactly as intended.

Although pooling was developed to equalize payments to producers for milk sold in a market, it brought

with it some problems. It may interfere with the role of price in balancing milk supplies with market needs.

The normal pattern of milk production is one of relatively higher production in the spring months of April, May, and June and lower production during the fall months of October, November, and December. The demand for milk does not fluctuate as much as production, therefore, it is usually felt that more efficient marketing can be accomplished by bringing production more nearly into line with consumer demand. To achieve this goal many markets have introduced methods which provide incentives to producers to adjust their production to a more level pattern.

The classified price plan itself provides some incentive, since Class I sales usually represent a higher proportion of total volume in the fall than in the spring. There are other devices aimed at providing a higher price to the producer who furnishes the market a uniform supply, than one whose supply fluctuates widely. They may be referred to as "base-rating," "base-surplus," or "base-excess" plans. Also there are "fall premium" plans.

Let us see where base rating fits into classified pricing. Classified pricing and pooling were developed as an improvement over the old flat price method. Some of the limitations of pooling as a means of distributing returns for milk among producers were discussed above. Base rating is a means of helping the pricing system reflect the time of year and amount of milk for different uses that are desired in a particular market. In addition, it is a means of rewarding producers who supply milk more nearly in line with the needs of the market.

Under a base rating plan the price received by producers is made up of two parts. The higher price is the "base" price while the lower is the "excess" price. Each producer is assigned a base in accordance with his daily deliveries during a specified base period. The base period is usually the short-supply fall months.

During the subsequent period, which is specified under the plan in use, a producer receives the "base price" for a quantity of milk equal to his base. He receives the "excess price" on all milk delivered in excess of the base. The base price is usually the fluid milk price—the excess price is usually the price for manufacturing milk.

Normally the total bases of all producers will about equal the fluid milk sales in the market plus the necessary reserve.

The most common type of base plan is one where new or adjusted bases are formed each year. Other types require a longer period for base forming. Some

types are partially or fully closed. Closed base types are those formed during a specified base forming period and remain closed for a number of years. The partially closed bases are adjusted each year by averaging the current year's production with that of the earlier base forming period.

Among some of the problems of base rating plans are the additional cost of administration necessitated by the extra work in making computations—establishment of bases for new producers—resentment to frequent revision by those who have already made adjustments in production in line with previous provisions—rules for transferring bases—and landlord and tenant interests.

A “fall premium plan” sometimes called the “take out and pay back plan” is practiced in some markets. It is also referred to as the “Louisville Plan” after the market that originally put the idea into effect.

Fall premium plans involve withholding a portion of money from all producers in the spring months. These funds are placed in trust with a responsible custodian. The following fall months the fund is disbursed among producers on the basis of their daily deliveries.

Formula Pricing

As pricing procedures developed, formulas were substituted for negotiated prices. Experience has shown that market milk prices move up and down in a fairly predictable relationship to certain other prices. Prices that are closely related can often be combined into statistical formulas that are useful for milk pricing. When formulas are used prices to farmers move up and down automatically in relation to the formula components.

Formulas for pricing Class I milk are of two general types, (1) economic formulas, and (2) manufacturing milk formulas. “Economic formulas” relate fluid milk prices to selected economic factors. Factors included in a formula that cause prices to move up or down are often called “movers.” Some of the movers in economic formulas include the wholesale price index, feed costs, volume of fluid milk sales, and similar items. Economic formulas are used predominantly in eastern and southern markets.

Manufacturing milk formulas are based on the value of milk when converted into certain manufactured milk products. “Butter-powder” or “butter-cheese” formulas are examples. They take into consideration the price of these products in determining the farm price of market milk. Specified amounts are usually added

to this basic price to account for the increased value of milk for fluid use. These formulas are predominantly used in the Midwest.

With the use of formulas, fewer price conferences and hearings are needed. This saves time and expense. Formulas have the advantage of being automatic and timely. It should be recognized, however, that it is impossible to design a perfect formula for pricing milk. Even the best require review and appraisal—and they are useful only to the extent that competent indicators are used in their development.

The following two illustrations of calculating the price of Class I milk use an economic formula and a manufacturing formula:

Pricing Class I Milk Under the Boston Federal Order¹

The Boston market uses an historical base as a starting point which is brought up to date by use of a formula. As a result of a hearing in 1952 the Class I price formula was revised to replace the years 1925–29 as the base period. The new base price was established at \$5.61, which was the average price for 1951. It was considered at that time that the price was about right to maintain a normal supply. For the future it was intended that the adjustment feature of the formula would raise or lower prices to maintain a normal supply in the market.

It was indicated earlier that in formula pricing there are “movers” which affect the calculated price when a sufficient change occurs in market conditions to affect the “movers.” In the Boston formula there are three such “movers:” (1) An average of three economic factors; (2) a supply-demand adjustment; and (3) a seasonal adjustment. The market uses a marketwide, monthly pool, without base rating or fall premium plan.

The following economic factors are used in the formula:

1. Prices of commodities at wholesale in the United States as collected monthly by the United States Government—to measure changes in the general economic conditions in the whole country.

2. The incomes of consumers in New England after payment of withholding taxes—to measure how much people have to spend.

3. Prices of feed and the wages paid to hired labor in New England—to partially measure the changes in the cost of producing milk in the area.

Supply-demand adjustment.—If the Boston market is

¹ What Makes the Price of Milk, Thurston M. Adams, University of Vermont and State Agricultural College, Burlington, Vt., Circular 124, January 1957.

to have enough milk, a reserve supply of 15 to 20 per cent over and above fluid milk needs is considered necessary in November, usually the month of lowest production. The reserve supply would be greater than this in the other months as production increased seasonally. So, based on past records of production and sales, a normal supply is determined for each month of the year. If the actual supply is greater than this, then it is considered that the market is more than adequately supplied and something should be deducted from the price. On the other hand, if the supply is below normal, the price should be increased. It is worked out in percentages as shown below. The adjustment that would result with a \$5.50 Class I price under the three economic factors is used.

<i>Supply above normal</i> (Percent)	<i>Taken from price</i> (Cents)
12-----	66
8-----	44
4-----	22
0-----	0
<i>Supply below normal</i> (Percent)	<i>Added to price</i> (Cents)
5-----	22
7-----	44
9-----	66

Seasonal adjustment.—This mover is used to raise the Class I price in the short production months, and to lower it during the months of flush production. Yearly average milk prices are not much different because of this adjustment, but those who supply a larger proportion of their milk in the months of short supply are rewarded. Again the adjustment is worked out on a percentage basis. Prices are designed to move in 22-cent intervals—about one-half cent a quart. If the annual average of Class I price is \$5.50, the following adjustments would occur:

	<i>Cents</i>
January -----	+22
February -----	+22
March -----	0
April -----	-44
May -----	-66
June -----	-66
July -----	-22
August -----	0
September -----	+22
October -----	+44
November -----	+44
December -----	+44
Average -----	0

Using November 1956 as an example for determining the Class I price the adjustment resulting from the economic factors would be:

*Percent change
from 1951*

Wholesale prices in the United States-----	+1
Consumer incomes in New England-----	+20
Grain and labor prices in New England-----	+7

Average of 3 factors $28 \div 3 =$ ----- +9

At this point in the calculation the price would be 9 percent above the basic formula price of \$5.61 or \$6.11 ($\$5.61 \times .09 = .50$).

But there was a 4 percent above normal supply of milk in the market, so, according to the supply-demand schedule above that would amount to a deduction of 22 cents per hundred for the month.

We may observe how some factors raise the price and other factors lower the price. If we look at the seasonal adjustment schedule above it will be noted that 44 cents is to be added to the price in November because it is normally a month of low supply.

Now when the effect of the movers in the formula are applied to the basic formula price we get:

Basic formula price-----	\$5.61
Economic factor adjustment-----	+ .50
Supply and demand adjustment-----	— .22
Seasonal adjustment-----	+ .44

Class I price calculated for November 1956----- \$6.33

Class I prices in the Boston market are designed to move in 22-cent intervals—about one-half cent a quart. Any time the calculations come out between \$6.20 and \$6.42, the Class I price is \$6.31—the midpoint in this range. So the actual price in the Boston market for November 1956 was \$6.31. This pricing adjustment is called “bracketing” and in the Boston market is designed to keep prices from changing in amounts smaller than one-half cent per quart. Brackets have been developed for price ranges above and below the one described here.

Pricing Class I Milk Under the Kansas City Federal Order

The Kansas City market uses a basic formula price derived by using the higher of the following alternative uses of milk for manufacturing:

1. Average of prices paid for 3.5 percent milk received from farmers during the month at specified Midwest condenseries adjusted to 3.8 percent butterfat by dividing by 3.5 and multiplying by 3.8.

2. Chicago price of 92-score butter $\times 1.2 \times 3.8$, plus Chicago-area spray-roller-powder price $-5.5\phi \times 7$. (The 1.2 factor times the butter price allows for most of the overrun in butter which contains about 80 per-

cent butterfat. The butterfat value is then multiplied by 3.8, the number of pounds of butterfat in 100 pounds of milk testing 3.8 percent. The factor 7 is a little under the normal yield of nonfat dry milk from 100 pounds of milk after the cream has been removed for use in butter. The understated overrun and yield factors together with the 5.5 cents subtracted from the powder price, represent the margin for processing and marketing butter and nonfat dry milk).

This market uses a marketwide, monthly pool with base rating plan, but no fall premium plan.

The Class I differential with seasonal adjustment to be added to the base price is:

April through July----- \$1.15
All other months----- 1.45

The supply-demand adjustment, not to exceed 45 cents, is calculated as follows:

A "current utilization percentage" is computed from the percentage which the total volume of producer receipts are of the total gross volume of Class I sales for the first and second preceding months.

Determination is then made of the amount by which such "current utilization percentage" exceeds the higher figure, or is less than the lower figure, of the appropriate "base utilization range" in the schedule at the top of the next column.

The resulting "net deviation percentage" determines the specific price adjustment according to the rates listed. The deviation percentage is to measure the degree that normal market needs for Class I milk are being met.

The rates are established on a sliding scale basis so as to allow for nominal but progressive rate of ad-

Month to which price applies	Base utilization range	Month to which price applies	Base utilization range
January.....	122-128	July.....	150-160
February.....	124-130	August.....	146-154
March.....	125-131	September.....	138-146
April.....	127-134	October.....	127-133
May.....	130-137	November.....	117-123
June.....	144-153	December.....	120-126

justment based on variations which persist in a like direction for two or three consecutive 2-month periods:

1. One cent for each percentage deviation, plus,
2. One cent for each such percentage deviation for which a percentage point of deviation of like direction was computed for the preceding delivery period, plus,
3. One cent for each percentage deviation for which percentage points of net deviation in like direction were computed for each of the first and second delivery periods immediately preceding.

The provision for a progressive rate of adjustment is to multiply or compound the degree of adjustment when the need for it persists over several months. For example, a 1-cent adjustment the first month could become a 3-cent adjustment in a period of 3 months.

Determination of November 1956 Class I price:

Basic formula price----- \$3.4906
(the higher of the condensery or butter powder price)
Class I differential----- +1.45
(schedule above)
Supply-demand adjustment----- -.07
(calculated below)

Class I price----- \$4.8706

Computation of supply-demand adjustment

	Sept. 1956 (July-Aug.)	Oct. 1956 (Aug.-Sept.)	Nov. 1956 (Sept.-Oct.)
Producer receipts (1).....	70,157,654	70,403,830	74,903,978
Total Class I sales (2).....	50,328,274	53,736,471	57,445,086
(1)÷(2)×100=Current utilization percentage.....	139	131	130
Standard of utilization (See table above).....	138-146	127-133	117-123
Minus or plus deviation (From base utilization range).....	0	0	+7
Rate of adjustment under item 1.....			-7¢
Rate of adjustment under item 2.....		0	
Rate of adjustment under item 3.....	0		
Supply-demand adjustment for November 1956.....			-7¢

PART 3. THE ROLE OF GOVERNMENT IN THE DAIRY INDUSTRY

Beginning in the early 1930's State and Federal Governments began to play an increasingly important role in the dairy industry. Among major activities of the Federal Government are the Federal milk marketing order program, the price support program, and the food distribution program. State governments are concerned mostly with price regulation and sanitary enforcement.

The Federal order program affects most of the milk associated with the larger fluid milk markets. The price support program affects the entire dairy industry. It affects the manufacturing segment directly through purchase of manufactured products. It affects the fluid milk segment indirectly by establishing a floor under prices of manufactured dairy products which serve as a base for determining fluid milk prices.

The more important governmental developments came during periods of national stress or emergency, such as the depression of the early 1930's, the Second World War, and the postwar adjustment period. A review of these developments should be helpful in understanding the current situation.

Background

Before 1933 activities of the Government were devoted largely to research in efficient milk production on farms, efficient handling in plants, and the dissemination of production and marketing statistics. Also there were programs to eradicate bovine tuberculosis, develop inspection and grading services, and protect consumers against fraud and adulteration.

A recent governmental activity has placed renewed emphasis on suppressing and eradicating brucellosis in cattle. The Secretary of Agriculture was authorized to use \$15 million during each of fiscal years 1955 and 1956 to further the eradication program. This authority was later extended to include fiscal years 1957 and 1958 and the funds increased to \$20 million annually.



BN 5493

In the early days when farmers delivered milk directly to homes "price" was the result of simple agreements between farmers and their customers. As marketing methods became more specialized dealers took over the job of distributing milk. Then pricing involved more people and became complex. The effect of this change was to put farmers in a less favorable bargaining position.

As early as 1900 erratic and widely fluctuating prices had become a serious and characteristic problem of fluid milk markets. Following the First World War, many farmers formed cooperatives in an effort to stabilize price through collective bargaining. But these bargaining arrangements frequently were disrupted by a minority of dairy farmers and dealers who continued to trade in milk without regard to the bargaining agreements entered into by the majority.

Conditions Leading to Governmental Intervention

Under a situation of price instability, farmers in many markets during the early 1930's found themselves virtually powerless to prevent unreasonable price manipulation. Dealers, driven by sharply competitive conditions often engaged in "price wars." Losses were often passed back to farmers in the form of lower prices. In an effort to combat these difficulties farmers established milk depots and roadside stands; milk peddlers and cutrate stores appeared in great numbers. Some stores began to use milk as a "loss leader." Milk strikes broke out, with trucks stopped and the milk dumped. These conditions led to the enactment of laws authorizing public regulation of milk prices by a number of States as well as the Federal Government.

Recent writing on increased governmental activity in times of emergency raises the question whether the conditions actually brought about this governmental activity. Possibly the times provided the setting for dealing with deep-seated problems that had not previously come to the surface. This idea is discussed by authorities on agricultural conditions as follows:²

. . . These facts do not explain fully why public intervention in the dairy marketing process has

² Murray R. Benedict and Oscar C. Stine, *The Agricultural Commodity Programs*, Twentieth Century Fund, 1956, p. 443.

taken the form it has or why it has continued after the period of acute emergency has passed. The depression did not create the underlying need for economic regulation of the fluid milk markets. It did create pressures that revealed inherent structural weaknesses in the organization of the industry. In some markets, the strain was greater than the marketing machinery could stand and it broke down. However, the basic reason for increasing resort to public regulation lies in the nature of the demand for fluid milk, the conditions under which milk is produced and sold, and the characteristics of milk itself.

. . . The principal controversies have centered on the methods of control, the policies to be followed and the governmental level at which controls will be established, that is State or National. . . . It seems likely that public regulation of some kind, in the fluid milk markets, would have developed long before 1933 had it not been for the deep and general aversion to public participation in economic activities during that period . . . Once the idea of classified prices has been accepted, there is equally evident need for some agency, public or private, to do the auditing and accounting that is necessary for maintaining a suitable balance between the interests of the producers, the dealers and the general public.

Federal Milk Marketing Orders³

Federal authority to regulate the handling of milk was first provided in the Agricultural Act of 1933. The Federal orders of today, however, are based on the Agricultural Marketing Agreement Act of 1937, as amended, which sets out in detail the authority granted earlier.

In September 1956 there were 67 marketing areas in the United States, in which minimum prices paid to farmers for milk were regulated by Federal milk marketing orders. About one-third of the milk sold wholesale by farmers in 1956 was marketed under provisions of these orders.

Federal orders define the terms under which dairy-men sell their milk to handlers. The purpose is to maintain marketing conditions that will assure con-

sumers a dependable supply of pure and wholesome milk and be in the public interest.

Orderly marketing is sought by spelling out in advance the terms for both buyers and sellers. These terms are developed largely through public hearings where producers, handlers and consumers have an opportunity to participate. Once an order is in effect, information about supply and demand is collected and made available to all interested parties.

A Federal milk marketing order applies to a specified marketing area. This area is defined in each order. Geographically the market area usually includes that area in which major distributors are competing with each other for sales. Such an area usually includes a principal city and its suburbs.

Handlers within the market area are the only persons regulated. Handlers are usually defined as anyone who purchases "approved milk" from farmers for selling in the market area. A handler must pay the minimum price, make accurate weights and tests, and account for the way milk is used. Farmers receive their checks once or twice monthly, generally from the milk handlers. Legal action can be taken against handlers who fail to comply. In practice, rather few legal actions have been necessary to enforce compliance with orders.

Under a Federal order handlers pay for milk in accordance with a classified pricing plan. Proceeds of milk sales are distributed among producers by a pooling arrangement specified in the order. Some markets have base rating or other seasonal plans. The order price is a minimum price and dealers sometimes pay a premium to producers.

Federal orders do not substitute for producer cooperatives. Cooperatives represent their members at hearings and carry on many other marketing functions outside the scope of a marketing order.

Each order is administered by a market administrator, appointed by the Secretary of Agriculture. Since only milk handlers are regulated, the market administrator's principal duty is to be certain that handlers are accounting for their milk receipts and making payments to producers in accordance with the order. The market administrator's staff audits handlers' records to be sure that full payments are made to producers.

The costs of operating a Federal order are defrayed by assessments on the milk received by dealers. Each order provides the rate of assessment which varies among markets. This usually ranges from 2 to 5 cents per hundredweight depending on the volume of milk in

³ For more complete information see "Federal Milk Marketing Orders, Their Establishment, Terms, and Operation," Misc. Publication 732, Agricultural Marketing Service, USDA, October 1956. When provisions of a particular order are of interest, the order itself should be studied.

the market, and services provided by the milk market administrator's office.

Frequently people have misconceptions as to the scope of Federal orders. Some of the more common limitations of Federal orders are the following:

Federal milk marketing orders:

Do not guarantee a given price level—prices are determined to reflect supply and demand conditions and assure an adequate supply of pure and wholesome milk, and be in the public interest.

Do not set resale prices—only minimum prices paid by handlers for milk going into various uses. In the absence of resale price fixing by a State agency, resale prices are established by the milk dealers.

Do not guarantee farmers a buyer—handlers are not required to purchase milk from a particular farmer.

Do not control production or prohibit the marketing of milk from any production area in any area of consumption.

Do not establish or enforce sanitary standards—this is handled by local authorities.

Procedure for Developing Federal Orders

A number of steps are taken to obtain a Federal order within a market. Several months or more may be required to complete the process. This is the procedure followed:

1. Some group, usually a milk marketing cooperative, requests an order. This is done through a petition to the Secretary of Agriculture. Usually a proposed order is submitted at the same time.

2. An investigation is made by a representative of the Department of Agriculture to determine if need exists for an order.

3. If it is decided to proceed, a notice of public hearing and the proposed order is placed in the Federal Register. At the same time local publicity is given to the proposed order and the time and place of the hearing.

4. A public hearing is held in the area where the order will apply. Here all interested parties, including producers, milk handlers, and consumers, are given an opportunity to present testimony relative to any order that might be issued.

5. Based on this hearing record, a Recommended Decision and Order is developed. These documents are published in the Federal Register.

6. A period of time, up to 20 days, is allowed for

interested parties to examine the proposal. They can file exceptions to any part of it.

7. The opinions expressed in these exceptions are considered. Changes in the original proposal are made as deemed necessary in view of the exceptions.

8. The Final Decision and Final Order are issued. Publication is made in the Federal Register.

9. The order becomes effective at a date specified by the Secretary of Agriculture. Approval must have been expressed by at least two-thirds of the producers voting in a referendum conducted by the Department of Agriculture. (If the order provides for individual handler pools, by three-fourths of the producers.)

Orders usually are amended or changed by following the same steps outlined above. To cope with emergency situations, orders are sometimes suspended, in whole or in part. An order must be terminated if requested by a majority of the producers supplying more than half of the milk in the market. It may also be terminated by the Secretary of Agriculture if he finds it no longer accomplishes the purposes of the Act.

State Milk Controls

State milk control laws grew out of the same conditions which gave rise to the Federal order programs. In early 1932 some States had legislation under way to permit milk price controls. Between 1933 and 1940 at least 26 States passed milk control laws. Most of this legislation was passed on an emergency basis. In the meantime many States appear to have accepted these laws as a part of their recognized governmental activity.

In September 1956, the following 16 States had laws which authorized the establishment of prices for milk: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Virginia, Georgia, Florida, Alabama, North Carolina, Montana, and California. Note that most States with milk control are eastern seaboard States, plus California and Montana.

The laws authorizing respective State milk control vary greatly among the States. The agencies designated to administer the laws also differ widely. Some function under direction of a single officer, while others are administered by boards or commission.

No single method of financing appears to predominate. Funds come from legislative appropriations, license fees and assessments, or various combinations of the three methods. State expenditures for milk control range from about \$5,000 for a small State like Vermont to over \$500,000 for a State like New York.

GEOGRAPHY OF FLUID MILK PRICE REGULATIONS



U. S. DEPARTMENT OF AGRICULTURE

NEG. 622A-56 (8) AGRICULTURAL MARKETING SERVICE

Here is a summary of the general powers granted to State milk control programs by State legislatures:

1. Licensing of dealers is prescribed by all State milk control laws.
2. Bonding of dealers to protect producer payments is frequently required.
3. All State milk control laws require records and periodic reports from handlers.
4. Auditing or inspecting of dealer's records is authorized in all State milk control laws.
5. Fixing the minimum producer prices is authorized in all States with State milk control.
6. Fixing of resale prices is provided for in 12 States.
7. Regulation of milk weighing and testing (checking dealer's milk samples) is frequently authorized.
8. Some States regulate trade practices: Premiums, bottle deposits, and frequency of delivery.

All State milk controls provide for pricing milk on a classified-use plan. Most States are divided into

various marketing areas for purposes of price regulation. Some of the smaller States, however, have one price effective for the entire State.

Standards and objectives of pricing are specified by the laws. More emphasis is placed on cost of production by State milk control bodies than in the case of Federal orders. In some States cost of production predominates the hearing testimony. In resale price fixing dealer's cost of distribution is given heavy consideration.

While pooling is involved in all State regulation, most use is made of the individual handler type of pool. Some markets, however, have marketwide pools as part of their regulatory machinery. Seasonal pricing of various sorts is practiced by State milk control agencies.

The problems encountered under State milk control in establishing producer prices are similar to those under Federal milk marketing orders. One important difference is that the power of a State to establish prices stops at its borders.

The Price Support Program

Paradoxically, some of the price-support activities pertaining to surpluses since the Second World War had their foundation in wartime programs aimed at increasing production. At the outbreak of the war the national problem suddenly shifted from dealing with surpluses to one of assuring adequate supplies of milk.

Wartime wages not only increased the demand for dairy foods, but enticed some dairy farmers, as well as their help, to seek industrial employment. At the same time production costs moved upward faster than prices received for milk.

Adequate milk supplies were considered essential to the war effort. Subsidies were provided during the war years to encourage dairy production. The Steagall Amendment was passed in 1941. Under this law the Secretary of Agriculture could support any nonbasic agricultural commodity to encourage increased production at not less than 85 percent of parity. This was later increased to 90 percent of parity to continue for 2 years after the cessation of hostilities.

Following the Second World War, the demand for dairy products for military and foreign use declined sharply. It appeared desirable to extend Government assistance through price supports. The Agricultural Act of 1948 extended the price support authorization at 90 percent of parity for milk and butterfat (which was due to expire at the end of 1948) until January 1, 1950. The following year the Agricultural Act of 1949 authorized and directed the Secretary of Agriculture to support prices to producers of milk and butterfat at such level between 75 and 90 percent of parity as would assure an adequate supply of milk.

In several of the postwar years it was necessary to make substantial purchases of dairy products to support prices at the announced levels. In 1951 and 1952 Government purchases were minor as prices to producers were above support levels. During most of

1951 and 1952 the Government had no inventories of butter and cheese and relatively low inventories of nonfat dry milk. As milk production increased at the end of 1952 the Government resumed heavy buying. Inventories mounted in 1953 and 1954. See table 9.

Sizable amounts of dairy products were donated to charitable institutions. Orphanages, homes for the aged, mental hospitals, nonprofit school lunch programs, and other eligible outlets received donations. In addition, donations were made to private (non-public) welfare agencies for distribution to needy persons in foreign countries. Also dairy products were sold to the United Nations' Children's Fund and to foreign governments at reduced prices for welfare use.

In 1954 several steps were taken to halt the buildup of Government stocks of dairy products: (1) The price support level was reduced from 90 to 75 percent of parity; (2) the special school milk program authorized under the Agricultural Act of 1954 was begun to divert milk into direct consumption. It was felt that this was milk that might otherwise be used for products that end up in Government stocks; (3) the Agricultural Act of 1954 also opened up additional opportunities for utilizing Government stocks; and (4) The Agricultural Trade Development and Assistance Act of 1954 (Public Law 480) was passed.

The latter act was designed to encourage foreign sales by making it possible for countries unable to pay for surplus agricultural commodities in dollars or other "hard" currency to make other arrangements for purchasing. Relatively minor amounts of dairy products have been utilized under Public Law 480. The major foreign utilization has been through donations.

During 1954, 578 million pounds, or the equivalent of half the previous year's production of nonfat dry milk solids, was utilized in mixed animal feed at a time when protein feeds were in tight supply. Under the broadened authority provided by the Agricultural Act

TABLE 9.—*Dairy price support purchases of butter, cheddar cheese, and nonfat dry milk solids, 1949–56*

Item	1949	1950	1951	1952	1953	1954	1955	1956
	<i>Million pounds</i>	<i>Million pounds</i>	<i>Million pounds</i>	<i>Million pounds</i>	<i>Million pounds</i>	<i>Million pounds</i>	<i>Million pounds</i>	<i>Million pounds</i>
Butter.....	114.3	127.9	0.2	16.1	358.9	¹ 319.7	162.4	164.7
Cheddar cheese.....	25.5	108.9	0.8	2.8	291.0	¹ 275.1	150.0	187.9
Nonfat dry milk.....	325.5	351.6	53.6	51.5	587.4	650.6	555.7	754.1

¹ Excludes quantities of butter and cheese sold to Commodity Credit Corporation in March 1954 but contracted for repurchase by private firms after April 1, 1954. Quantities excluded: Butter, 5.1 million pounds; cheese, 86.6 million pounds.

Dairy Situation, No. 259, March 29, 1957, p. 21, Agricultural Marketing Service, U. S. Department of Agriculture.

TABLE 10.—*Percentage of total production of each specified dairy product purchased for price support, 1949–56*

Item	1949	1950	1951	1952	1953	1954	1955	1956
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Creamery butter.....	8.1	9.2	.....	1.4	25.4	22.1	11.7	11.7
Cheddar cheese.....	2.7	12.2	.....	0.3	28.5	26.3	14.9	18.6
Nonfat dry milk.....	34.8	39.9	7.6	6.0	48.4	46.4	39.4	50.9

The rapid increase in production of nonfat dry milk relative to the rate of consumption discussed on page 11 is reflected in the stepped-up Government purchases of dry milk in recent years.

of 1954 substantial quantities of dairy products have been transferred for increased consumption by military personnel and veteran's hospital patients. Also, a special program has been adopted under which Commodity Credit Corporation has paid part of the cost of increased milk consumption by the military personnel and veteran's hospital patients. In 1956 the men in the Army, Navy, Marine Corps, and Air Force consumed 65 percent more milk than their normal consumption as a result of this program.

Frequently information pertaining to the amounts of dairy products purchased for price support, the proportion of national production so acquired, and the cost to the Government is desired. A summary of price support activities for the post war period is shown in tables 9, 10, 11, and 12.

During 1956 for the first time since late in 1952 the stocks of butter held by Government were depleted and stocks of nonfat dry milk were relatively small. Dispositions of butter and nonfat dry milk acquired through price support operations were being made about as fast as acquisitions. Although Government stocks of cheese were still substantial, dispositions were being made at a faster rate than acquisitions, thus reducing the inventory of cheese.

Food Distribution Programs

Food distribution programs are designed to expand agricultural markets by improving food consumption

levels and by finding outlets for food available in surplus supply. They began in 1935 with the donation of surplus foods acquired by the Department of Agriculture to low income groups. This program, called Direct Distribution, is still in operation. However, increasing emphasis under these programs has been designed to expand the purchase of dairy products from regular suppliers.

Section 32 of the Act of August 24, 1935 provides the Department of Agriculture with an annual appropriation (equal to 30 percent of the annual custom receipts) to expand markets for agricultural commodities. Surplus-removal operations, under which the Government purchases a portion of the market supply to relieve distress conditions, are financed with these funds. The supplies so purchased are donated to States for use in nonprofit school lunch programs, and to the needy in charitable institutions and family units.

The volume of foods donated under this program varies each year, depending upon purchases required to stabilize the market. Large quantities were distributed between 1935 and 1941. During the Second World War only limited donations were made. The volume has increased in recent years.

The Penny School Milk Program was established in 1940. Because whole milk could not be handled under a Government purchase and donation program, this program operated under a system of cash assistance payments, utilizing normal trade channels. Participating schools purchased milk from local dairies.

TABLE 11.—*Percentage of total milk production purchased for price support on a milk fat basis and solids-not-fat basis, 1949–56*

Item	1949	1950	1951	1952	1953	1954	1955	1956
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Milk fat.....	2.2	3.0	(¹)	0.3	8.2	7.3	3.8	4.0
Solids-not-fat.....	3.0	3.5	0.5	0.5	6.0	6.5	5.2	6.9

¹ Less than 0.05 percent.

Dairy Situation, No. 259, March 29, 1957, p. 21, Agricultural Marketing Service, U. S. Department of Agriculture.

TABLE 12.—All dairy products: Sales proceeds and costs from price-support purchases and related programs, year beginning July, 1948–56

Year beginning July and item	Total cost to Government and to Commodity Credit Corporation	Financial outcome from disposition of product			
		Commodity Credit Corporation		Total Government	
		Sales proceeds	Net expenditures	Sales proceeds	Net expenditures
Total dispositions:	<i>Million dollars</i>	<i>Million dollars</i>	<i>Million dollars</i>	<i>Million dollars</i>	<i>Million dollars</i>
1948.....	0.9	1.0	10.1	1.0	10.1
1949.....	50.1	30.3	19.8	13.7	36.4
1950.....	231.8	121.1	110.7	122.0	109.8
1951.....	9.5	8.4	1.1	3.2	6.3
1952.....	27.7	22.5	5.2	3.6	24.1
1953.....	257.8	127.0	130.8	56.7	201.1
1954.....	478.9	65.1	413.8	26.8	452.1
1955.....	490.9	94.1	396.8	71.0	419.9
1956.....	344.1	130.0	214.1	19.6	324.5
Total.....	1,891.7	599.5	1,292.2	317.6	1,574.1
Direct purchases (for Sec. 32):²					
1949.....	1.0	1.0	0	0	1.0
1950.....	3.0	3.0	0	0	3.0
1951.....	7.7	7.7	0	0	7.7
1952.....	1.8	1.8	0	0	1.8
1953.....	11.4	11.4	0	0	11.4
Total.....	24.9	24.9	0	0	24.9

¹ Credit.

² Sec. 32 of Pub. Law No. 320, 74th Cong., passed in 1935, provides the Department of Agriculture with funds, equal to 30 percent of the annual custom receipts, for the general purpose of expanding domestic and export markets for agricultural commodities.

Compilation made by Commodity Stabilization Service.

Section 32 funds were used to reimburse schools for the difference between the selling price to children and the cost of milk to the school.

In 1943 the Department of Agriculture established the school lunch cash food assistance program, including milk and other dairy products. The Penny School Milk Program was merged with this new program. Donations of surplus commodities continued, although the large wartime demand for food had greatly reduced the volume of purchases under Section 32.

The National School Lunch Act was passed in 1946. It authorized the continuance of food assistance both in the form of cash payments and donations of Section 32 commodities. Under Section 6 of the Act, the Department of Agriculture also was authorized to use a portion (approximately 15 percent) of the annual school lunch appropriation to make large-volume purchases of foods for the program.

The Plentiful Foods Program, developed in 1947, is another distribution activity which operates through normal trade channels. It is designed to enlist the cooperation of food distributors and informational

media in trade merchandising and promotion campaigns. Through these efforts, consumer attention is focussed on those foods available in plentiful supply, in an effort to stimulate sales. Each year, under this program, the Department supports the industry "June Dairy Month" campaign.

Section 416 of the Agricultural Act of 1949, provided authority to the Department to donate foods acquired under the price support program to nonprofit school lunch programs in this country and to needy persons both in this country and abroad. This was the first authority provided to the Department to donate surplus foods to the needy overseas. The Act required these foreign donations to be accomplished through United States private welfare agencies.

The Agricultural Trade Development and Assistance Act of 1954 further extended this donation authority by making intergovernmental groups, such as United Nations International Children's Emergency Fund, eligible to receive such donations.

The Agricultural Act of 1954 authorized the use of up to \$50 million of Commodity Credit Corporation funds in 1954–55 and 1955–56 to increase the con-

sumption of fluid milk by children in nonprofit schools of high school grade and under. The Special Milk Program was established under this authority.

The Special Milk Program was increased to a maximum of \$75 million a year for fiscal years 1957 and 1958. Many more children became eligible by extension of the program to nursery schools, settlement houses, summer camps, and similar nonprofit child-care institutions.

During the school year ending in June 1956, more than 62,000 schools took part in the program, a gain of more than 50 percent over the previous year. A total of 1.4 billion half pints of milk was consumed in schools under the program for that school year. This amount of milk was about the equivalent of 0.6 percent of total United States milk production for 1956. This

was in addition to the 1.7 billion half pints of milk consumed by children under the National School Lunch Program.

In the 1955-56 school year, the number of children participating in the National School Lunch Program totaled 10.5 million and the number eating complete lunches with milk increased to about 9.6 million, a 10 percent gain over the previous year. Funds available for this program were increased from \$83.2 million in 1955-56 to \$100 million for the 1956-57 fiscal year. In addition to using almost \$115 million worth of donated foods in 1956, participating schools made local purchases of food valued at \$367 million. The Federal contribution financed \$67 million worth of these local purchases; funds from State and local sources financed the remainder.

PART 4. PRODUCER RESPONSE TO PRICE CHANGES

In the earlier discussion of price theory, page 17, it was pointed out that changes in prices are a result of the interaction of supply and demand, and that in our free enterprise economy prices influence both production and consumption. In the absence of a price support program, when our population wants to consume more milk and is willing and able to pay for it, it is said that demand is increased. Stronger demand brings about an increase in prices and encourages production. Conversely when less milk is demanded this situation is reflected by a lower price in the market place. A weaker demand reflected through lower prices discourages production.

In recent years, there has been considerable interest in association between milk prices and milk production. A number of relevant factors in this complex relationship are discussed in the following statement:¹

From 1952 to 1953, milk production showed a record increase for a single year's time—rising 114.7 billion pounds to 120.2 billion in 1953. Increases have occurred in each year since 1953, but at only from 1 to 2 billion pounds per year. In fact, the entire increase from 1953 to 1956 (3 years) was just equal to the 5.5 billion pound increase between 1952 and 1953 (1 year). Another increase of about a billion pounds took place in 1957.

The impact of the 1952-53 increase in supplies led to downward pressure on prices and heavy sales to CCC under the support program. The

support level was adjusted downward in 1953, but thereafter prices rose slightly, through 1957.

In considering the interrelationship between milk prices and milk production it is easy to overlook the fact that there were declines in some other relevant prices also after 1953. Greater declines in prices for hogs, beef cattle and calves, than for milk from 1953 to 1954 and 1955 enhanced the competitive position of dairying relative to these other enterprises, in areas where these are produced. It is recognized, of course, that cash receipts from all these items declined when prices dropped.

There were other offsets to the initial price drop. These changes, combined with some other developments since 1954, indicate that the response of dairy farmers to price fluctuations the last several years was entirely normal.

Now, how did all this happen? How much did actual prices decline?

The average 1953 price for all milk was \$4.32 per 100 pounds, compared with the record \$4.85 in 1952—a drop of 53 cents. From 1953 to 1954, the decline was an additional 35 cents. This makes a total decline of 88 cents, or 18 percent, over the 2 year period.

Milk prices showed a slight increase from 1954 to 1955. Moreover, dairy prices became favorable relative to feed prices, as support levels on feed grains were lowered relatively more than support prices on milk, and large harvests kept grain prices at support levels.

¹From preliminary draft of statement prepared by Herbert C. Kriesel, Agricultural Marketing Service, U. S. Department of Agriculture, Washington, D. C.

Relatively few farmers now sell both hogs and/or beef cattle and dairy products. So consequently relatively few farmers realize there are partial offsets to the lower dairy prices. All dairymen, of course, purchase at least some feed, and benefit from lower feed prices. Despite these offsets, of whatever magnitude they may have been, the reduction from 1952 to 1954—averaging 18 percent for the United States as a whole—was sizable.

Such a sharp price reduction could be expected to affect a farmer in either or both of two ways. First, it might call to a dairyman's attention certain inefficiencies of his organization. Second, it might compel him to make some permanent improvements he had been planning, anyhow.

It's frequently said that farmers affected by the second are those who would have no alternative but to work longer days and sacrifice their leisure in order to increase the milk flow and meet their fixed expenses. Probably this explanation fits comparatively few actual situations. In any case, a farmer making such an adjustment presumably would plan to continue his new work rate only for a short time, that is until prices improve or until he could revamp his farm organization.

With or without the price drop for an inducement, many farmers have made fundamental changes in their farm organization. In most cases, these changes tend to increase production per farm. New techniques also are being constantly devised, techniques which will have a tendency to increase milk production, regardless of price relationships.

While dairy prices fell sharply from 1952 to 1954, the decline halted more quickly than declines for a number of other farm commodities. For example, prices for hogs and beef cattle did not begin to rise again until the autumn of 1955.

In the past 2 years, dairy prices have been gradually advancing. They moved from a United States average of \$3.97 in 1954 to \$4.02 in 1955, and \$4.13 in 1956. Moreover, a few cents were added in 1957. Thus, in much of the period that milk production has been increasing, milk prices have been showing some actual advances, though still continuing substantially below the 1952-53 level.

For much of 1955 and 1956, moreover, dairy prices were equal to or above average relative to prices for beef cattle and hogs. Also, the milk-

feed price ratio in this period reached the most favorable level on records going back to 1910.

In summary, therefore, it appears that dairymen have responded to changed economic conditions of the past 3 years about as could be expected.

The spurt in milk flow in 1953 and early 1954 must be attributed to delayed effects of earlier technological changes and to price support levels braking the price declines. In some instances, individual producers probably increased output in order to meet fixed expenses. Frequently, however, this expansion may have been planned anyhow, in order to take advantage of newer techniques.

Changing the physical structure of a dairy farm to take advantage of improved methods frequently requires substantial capital investment, though perhaps less than it would cost to replace some of the existing structures.

Some farmers are deciding they would rather discontinue dairying than to embark on such an expansion. As a result, for several years there has been a reduction of between 4 and 5 percent per year in number of farms with milk cows. In some States and market areas the reduction has been substantially greater.

The farms remaining in production, however, are increasing their scale fast enough to limit to about 1 percent per year the drop in total number of milk cows for the country as a whole.

Reference was made in the preceding statement to technological developments and adjustments to changes in economic conditions, see also page 14. Let us consider some forces or factors that determine changes in milk production.

Number of milk cows.—The number of milk cows would be a major factor in changing milk production. In the short run, 1 to 2 years, the level of milk production would not be expected to change much because cow numbers change rather slowly except in unusual circumstances such as widespread drought. If a large number of cows were disposed of the production of milk could be sharply curtailed, but the biologic nature of dairying makes a sudden and tremendous increase in milk production from this factor unlikely. Over the longer term, 3 to 5 years or more, the production of milk could be increased very substantially.

Cost of production.—One of the principles of economics states that in the long run unless producers receive cost of production they will cease production. So long as the price remains equal to or above the

cost of production, farmers will be expected to produce milk—taking into account, of course, alternative enterprises. But the cost of production is not the same for all producers. For example, reports from one State show milk production costs in a particular market ranging from \$4.83 per hundredweight in the low-cost herds to \$6.79 in the high-cost herds. Farm management studies in another State show this range from \$3.50 to \$9.50. Most States can furnish similar data.

Since dairymen are in competition with each other for the consumer milk market, there is continuous shifting among farmers into and out of dairying. When shifts take place that are not entirely offset by those in an opposite direction the result is a trend. There has been a longtime trend toward fewer farms with milk cows, and another trend of larger herds where milk cows are kept. The 1954 Census of Agriculture shows less than 3 million farms with milk cows compared with 3.6 million in 1950 and 4.6 million in 1940. The average number of cows per farm was 6.9 in 1954, about 20 percent higher than 1950 and 30 percent above 1940. Undoubtedly, among the factors that influence farmers to make such changes are the cost of production and the opportunity to shift to other farm enterprises or nonfarm pursuits.

Alternative enterprises.—A very important factor to consider in deciding whether to produce more or less milk, or whether to produce it at all, is the comparative advantage or disadvantage of other farm products. For example, take the following simple comparisons between the value of milk and other products.

The first comparison indicates the number of pounds of feed that was equivalent in value to one pound of wholesale milk for the years specified. The figures in the percentage column are calculated to show the change since 1940. Note that in 1945 a pound of milk was equal to 10 percent more feed than in 1940 and in 1954 it was equal to 8 percent less.

One Pound of Milk Buys How Much Feed?

Year	Pound of milk is worth	Percentage change since 1940
	<i>Pounds of feed</i>	
1940.....	1.29	
1945.....	1.42	+10
1950.....	1.24	-4
1951.....	1.29	
1952.....	1.28	-1
1953.....	1.25	-3
1954.....	1.19	-8
1955.....	1.28	-1
1956.....	1.36	+5

The next example compares condensary milk and hogs. Note that by 1954 hogs had become twice as good an alternative as they had been in 1940, because the same amount of milk was equal to only 50 percent as many hogs. This comparison points up the importance of selecting a base year. In 1940 the relationship between hogs and condensary milk was the most favorable for milk during the past quarter century.

One Pound of Condensary Milk Buys How Many Pounds of Hogs?

Year	Pound of milk is worth	Percentage change since 1940
	<i>Lbs. of hogs</i>	
1940.....	.26	
1945.....	.19	-27
1950.....	.16	-38
1951.....	.18	-31
1952.....	.21	-19
1953.....	.14	-46
1954.....	.13	-50
1955.....	.19	-27
1956.....	.20	-23

Likewise note that in 1945 a pound of condensary milk was equal to 17 percent more beef than in 1940, and in 1953 to 6 percent more; but in 1950 and 1951 a pound of milk was equal to only two-thirds as much beef as it had been in 1940.

One Pound of Condensary Milk Buys How Many Pounds of Beef Cattle?

Year	Pound of milk is worth	Percentage change since 1940
	<i>Lbs. of beef cattle</i>	
1940.....	.18	
1945.....	.21	+17
1950.....	.12	-33
1951.....	.12	-33
1952.....	.15	-17
1953.....	.19	+6
1954.....	.18	
1955.....	.18	
1956.....	.20	+11

These comparisons show how the relative values of the different commodities change over time and thus affect farmers' management decisions.

The opportunity for some farmers to shift from one enterprise to another tends to keep the returns from various enterprises in equilibrium. This is similar to the example on page 21 showing how opportunities to shift milk to different manufactured uses tends to keep milk prices in equilibrium.

A Hypothetical Adjustment

Finally, in our examination of the effect of price changes on production, let us consider a hypothetical case. Take for example, a farm with a dairy enterprise of 25 cows at the end of the Second World War. Let us assume further that technological developments since that time have made it possible to increase the herd to 30 cows without building additional barn space; that new methods of managing and fertilizing pastures and new varieties of crops and forage handled with modern machines under improved management have made it possible to produce on the same farm the additional feed required by the five extra cows added to the herd; also that with improved work methods and labor-saving devices it is possible to care for and milk the five cows with the same amount of labor as formerly; and that artificial breeding has added animals to the herd that are more efficient converters of feed into milk so that the present level of milk production relative to feed inputs is higher than formerly. For many readers this situation will be sufficiently "real" that it could hardly be termed "hypothetical."

Which of the two—changing prices or changing technology—contributed most to these changes? If you were this dairyman what would you have done? First of all, the increased supply of feed must have encouraged the addition of animals to utilize the extra feed. Secondly, the possibility of adding to the herd size without any major construction of buildings by utilizing bullpen or old horse stalls, shifting to parlor milking, or making other adjustments was a factor contributing to the increase in herd size. Third, more efficient use of the same labor supply was also a positive influence. Improved breeding made it possible to increase the supply of milk from replacement cows as well as from the additional cows. All of these adjustments tended to add to the volume of milk produced relative to production inputs. If the price of milk went down, the additional volume brought a larger gross income than would have been the case with the previous production. Theoretically, the larger volume would have been produced at lower per unit cost for many of the production items due to the economy of scale—that is at a certain cost figure the more units produced—the lower the cost of each unit. In the example above the building cost was assumed to remain the same, therefore it was divisible by the pro-

duction of 30 cows now compared with the production of 25 earlier. The higher yields of pasture and crops did not add to real estate taxes and interest on the investment in land or mortgage interest, whichever the case may be. Labor costs would also be divisible by the increased units produced.

If the price of milk had risen, then it seems that production would have been encouraged to increase income still more. Therefore under the assumed circumstances it seems that production would have increased whether prices increased or decreased, within reasonable limits.

This brings us to a point where the nature and extent of the change may be an important factor in the minds of dairymen as they analyze their business. If we assume that the changes made to increase the herd size in the example from 25 to 30 can be attributed largely to technological developments and there seems to be good reason to do so, then it seems logical to assume that the dairy enterprise as increased might now be at the optimum operating level—that of using barn space at optimum capacity, using labor at its optimum level, and utilization of home grown feed at the desired point.

Continuing with this assumption it would mean that to provide more barn space would require an addition to the barn; that to handle more cows would require additional labor, rather than using present labor more efficiently as was possible in the previous adjustment; and that more feed would have to be obtained either from additional land or purchased. It will be seen readily that the two stages of adjustment are decidedly different, and that the latter might cost more than the additional revenue from increased milk production would bring.

Let us reexamine the belief that a decline in milk prices brings about increased production. It appears that under some conditions farmers may increase milk production during a period when milk prices are declining. But this needs to be examined. Were relative prices such as the milk-grain price ratio also declining? (Actually farmers are more interested in price-cost relationships than in absolute prices.) If relative prices were declining it is possible that the price effects were overbalanced by farmers' actions in taking advantage of new technology. In other words, if milk production increases as relative milk prices decrease, with due allowances for lags in response, the increase in production probably is in spite of the price change and not because of it.

PART 5. FORECASTING THE DEMAND FOR AND SUPPLY OF MILK

Thus far in this handbook the emphasis has been on description, explanation, and analysis. In parts 1 and 3 which are mostly descriptive, you were given a bird's-eye view of the dairy industry and the role of Government. Part 2 was devoted to an explanation of the workings (theory) of the price mechanism. Part 4 dealt with an analysis of recent developments.

Now we come to forecasting in which we will make use of these three areas of subject matter. It is the purpose here to suggest a procedure which can be used in developing information that should be useful in making decisions about the dairy industry.

The following questions illustrate some of the decisions that are of concern to the dairy industry:

Producers.—Shall I produce milk? Where shall I produce it? At what price? For what kind of a market—fluid or manufacturing? How much shall I produce? What quality? With bulk tanks or cans?

Processors or handlers.—Where will a milk supply come from? What amount? What quality? Will it be received in bulk or cans? What products shall I make, and how much of each? Shall I deliver milk to homes or stores or both? What price shall I charge? What kind of package? Should I expand my distribution area?

Consumers.—Shall I use milk and dairy products? What is the cost? Are there satisfactory substitutes? How much shall I purchase? Shall I have it delivered at home or buy it at the store? What kind of containers?

In a dynamic economy such as ours, management decisions are frequent and complex. They pertain to the use of productive factors such as land, livestock, machinery, equipment, labor, and to pricing, demand, uses, distribution, and many others. Difficulties of making sound decisions are great because of the uncertainty of the future.

Yet, we can't act without making an estimate or prediction of the future. We are continually making choices or decisions, most of which are based on some estimate of the future. These choices may concern the next few minutes, the next few months or years. These decisions involve choosing among various alternatives—which garment to wear, what foods to eat, what profession to follow, where to live, and so on.

Every decision is based on some forecast—and action based on a forecast developed from a sound and

careful analysis should have a much greater chance of success.

How People Make Forecasts

People have different ways of making their forecasts of the future. The less informed may depend entirely on a hunch or intuition for his prediction; the highly skilled forecaster will rely on complex economic and statistical analyses. If these analyses have been highly accurate in the past in forecasting future events, their results may be used directly as a forecasting formula. This formula may range from simple arithmetic to highly complex mathematical formulations. Frequently, however, such analyses may be inadequate due to lack of data or other considerations. Here it is necessary for the analyst to adjust the formula-based forecast, blending in his personal judgment in making the predictions.

Let us take the first question that was posed above—shall I produce milk? This might be decided by flipping a coin, or by custom if the questioner's father had been a dairyman. But to go beyond this point involves some estimate of what the future may bring as a dairyman versus other alternatives. The "to be" or "not to be" dairyman may take a poll by asking several of his friends what they think the future of dairying may be. This method offers an opportunity to broaden the base for his own forecast.

Since the prospective dairyman realizes that he would be only one producer along with millions of others competing for milk markets he feels it important to consider what the aggregate or total situation in the Nation might be. Price will be an important determinant in his decision. Knowing more about the future demand for and supply of milk would be helpful in his analysis.

Furthermore, he knows that there are many factors that affect supply and demand that in turn influence price. To measure the effect of some of the important factors he might develop some formulas based on historical trends and market developments and make a calculation of probable supply and demand for a selected future date. A projection might be made by using graphic analysis in which the historical trend for selected factors would be extended into the future (also called extrapolation). An economic model might be used. Or one of the most modern devices to assist in forecasting—the electronic computer.

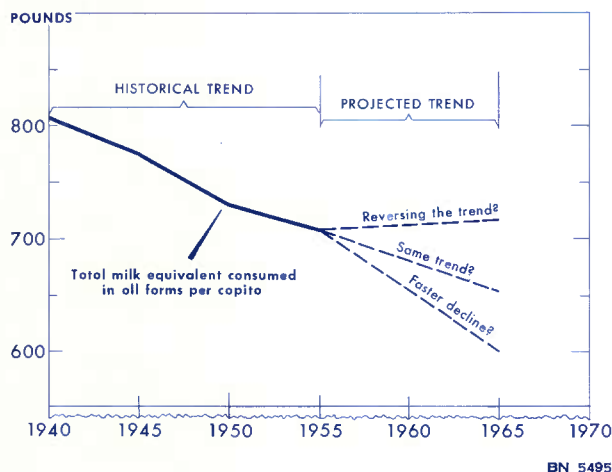
From among all the various approaches to forecasting that have been considered we will need to use a means that is simple and practical. We might think of ourselves as being in somewhat the same situation as a pilot of a small plane who flies occasionally. He is not a professional pilot—neither are we professional forecasters. If he wants to get his bearings without the use of instruments he probably looks for known landmarks such as a town or city, river, crossroad, hill or mountain, or lake. That is essentially what we will be doing—looking for landmarks to help us discover what the likely demand and supply of milk will be in the future.

An Example of Forecasting

In order to demonstrate a procedure to use in making a forecast—let us assume that we want to make the best estimate we can of the demand for and supply of milk in 1965. One of the tools discussed earlier should be helpful, namely, the projection of historical trends. We can refer to part 1 of this handbook for a number of historical trends, and the references, listed at the back, should provide us with additional ones.

Projection of Historical Trends

This approach is simple and practical. When coupled with good judgment it can be fairly reliable. It involves extending observed trends into the future with adjustments based on certain influences that might affect the projection. The idea is illustrated in figure 18.



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Figure 18.—An illustration of projecting an historical trend.

This demonstration will involve four main steps:

1. Decide as precisely as possible what we want to know.

2. Obtain information that will help to answer the question.
3. Analyze the information.
4. Develop our estimate of the future.

Step 1

We previously stated what we want to know—namely, the best estimate possible of the demand for and supply of milk for 1965.

Step 2

The kind of information needed for this step is illustrated in part 1 of the handbook and in the suggested references (page 44).

Step 3

Before proceeding with the analysis and interpretation we need to make some basic assumptions. They will provide the broad general setting for developing the more specific information. Again we can use the pilot for an example. Before he takes off he will have checked on the direction and speed of the wind so he can allow for side drifting or head wind; he will know about how long he will be flying at a given speed before he reaches his first important landmark; he will estimate his fuel needs; and other preparatory steps that are part of his forecast of the anticipated flight. Likewise in our projection we will need to consider such things as the number of people, consumer preferences, purchasing power, alternative farm enterprises, pertinent production factors, technological developments, competition, substitutes, and other factors that may have a bearing on our estimate of the future. In a sense historical data become landmarks for us.

The basic assumptions are that between now and 1965:

- a. There will not be war, but a condition of competitive coexistence will continue that will not encourage reduction in the defense program.
- b. The United States pricing system will continue to be the major force in allocating resources to various segments of our society.
- c. There will be continuous advance in technology and education.
- d. There will be 190 million people by 1965.
- e. Unemployment will not be more than 5 percent of the labor force.
- f. Disposable income of consumers will increase gradually.

Other assumptions could be added to this list. The assumptions help us draw a mental picture of the state of affairs and level of economic activity that will exist in the future into which we want to project an estimate of the dairy industry.

STEP 1:
The Question

The demand for and supply of milk in 1965

STEP 2:
Information
Needed

Demand

Supply

No. of people

Per capita
consumption

No. of cows

Production
per cow

STEP 3:
Analysis
and
Interpretation

Factors: *

Number now

- Rate of increase
- War
- Disease

Factors: *

- Price
- Consumer preferences
- Availability
- Purchasing power

Factors: *

- Alternative enterprises
- Heifer calves kept for milk
- Slaughter value of culls

Factors: *

- Wider use of improved sires
- Feeding
- Management

190 million

723 lbs.

20 million

7,000 lbs.

$190 \times 723 = 137.4$ billion lbs.
needed for calves = 3.0

$20 \text{ million} \times 7,000 \text{ lbs}$

STEP 4:
The Answer

140.4 billion lbs. of milk in 1965

* These are examples. There will be other factors to be considered.

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Figure 19.—An illustration of a method for forecasting milk demand and supply.

To provide an overall perspective of what we will be doing as we proceed with the steps outlined, the method is shown schematically in figure 19.

The diagram indicates that the demand for milk would be derived from the number of people in the United States times the consumption per capita. Since a projection of probable population for 1965 had been made, our main concern is to estimate probable per capita consumption. Figure 18 should give us a point of departure. It shows the total amount of milk consumed per capita and the historical trend.

For the illustration we will start with the latest known figure and then go through a "plus and minus" operation to adjust for factors that may affect the outcome.

In analyzing the demand for milk, we may find it a help to get a perspective of the proportion going into different uses so that we can give emphasis to the projection accordingly. For a number of recent years about three-fourths of the Nation's milk production has gone into two major uses: (1) Fluid for bottling (about 50 percent), and (2) butter (about 25 percent). The remaining one-fourth has been used for cheese, ice cream, evaporated, condensed, dry whole, and calves.

It may be helpful also to separate the different uses of milk in making our estimate to allow for offsetting trends. Since fluid milk is the largest single use let's start with it.

Fluid milk.—The average fresh whole milk consumption per person for the 10-year period 1947–56 was 303 pounds. On the basis of 4 glasses per quart, this was 1.53 glasses daily. The increase in per capita consumption from a recent low of 295 pounds in 1948 to 307 in 1956 amounted to 13 pounds. In view of the recommended daily allowance for good health and the effort directed toward increased consumption, it seems reasonable for this illustration to estimate a further increase of 5 pounds per capita for 1965.

Butter.—Butter is still the second largest user of our milk supply. Between 1935 and 1945 the average per capita consumption declined 6.5 pounds, and between 1945 and 1955 the decline was 1.9 pounds. For the last 5 years butter consumption per capita has remained practically unchanged, see page 9. Competition from margarine with a price advantage of more than 2 to 1 is being met currently by improved quality of butter, better merchandising, and increased promotion. For this example let us assume that the present level of per capita consumption will prevail.

Cheese.—The per capita consumption of cheese has

increased 1 pound each decade during the last 30 years, but consumption is well below that of some foreign countries. Considerable emphasis on improvement in merchandising and increased promotion has occurred in recent years; however, the rate of increase has slowed down. A one-half pound increase per capita in the next decade seems reasonable and would require an additional 5 pounds of milk per capita, see page 9.

Ice cream and frozen desserts.—Consumption of ice cream and frozen desserts doubled during the last two decades, see page 10. The net milk used per capita for ice cream in 1955 was 48.2 pounds and in 1945 was 37 pounds, or an increase of 11.2 pounds. This is calculated on a fat solids equivalent basis. The present trend is toward lower fat content in frozen desserts. Since the trend in per capita consumption has been upward let us assume an additional increase of 5 pounds of milk for this use.

Step 4

Illustration of a procedure for developing a projection of milk consumption for 1965

	Pounds per person
Total milk equivalent, all uses, 1956 (fat solids basis) ..	708
Fluid use, fresh whole milk, assumed changed	+5
Butter (no change assumed)	---
Cheese, assumed change	+5
Ice cream and frozen desserts, assumed change	+5
Other uses (no change assumed) --+	---
Total per capita	723
	Billion pounds
Estimated human consumption 723 pounds times 190 million people	137.4
Amount needed for calves	3.0
Assumed total milk needed in 1956	140.4

Let us turn now to an estimate of the potential supply of milk in 1965. This would involve a similar use of the four steps.

Average annual production of milk per cow has increased about 1,000 pounds during the last decade. The annual average production per cow of 6,000 pounds for 1956 is well below the average of 9,500 pounds for DHIA herds which is within the realm of expectation for many dairymen. The rate might increase faster now. The increased "know-how" of dairymen brings about better breeding and management. The trend toward larger and fewer herds will result in better managed units.

Projecting the same trend in the next decade as in the last would result in an annual rate of production of 7,000 pounds per cow by 1965. It seems reasonable

to expect this rate to continue at least until then. Seven States already have averages above that figure, and the average in California is 8,550 pounds per cow.

The number of milk cows in the United States in 1956 of 21 million head producing at the projected future rate of 7,000 pounds per cow by 1965 would produce a total milk supply of 147 billion pounds of

milk (actual production for 1956 was 125.7 billion pounds).

Another approach would be to estimate the number of cows needed to produce the amount of milk we assumed as needed in 1965 for human consumption in the United States using the new rate of production per cow. This would give us the following:

$$\frac{140.4 \text{ billion lbs. of milk}}{7,000 \text{ lbs. (rate of production per cow)}} = 20 \text{ million head of milk cows}$$

One of the basic assumptions, page 39, was that the pricing system would continue to be the major force in allocating resources to various segments of our society. Throughout this handbook in describing and explaining the economics of the dairy industry, a main objective has been to bring about a better understanding of the role of price and the function it serves in a free enterprise economy. To be consistent with this approach we have assumed that historically milk production has been guided by the demand for milk; furthermore in the absence of ceilings or supports that the demand was reflected through price which encouraged production through a rising price and discouraged production through a declining price.

Therefore it appears that under free pricing resources would be allocated to the dairy enterprise on enough farms to provide the amount of milk that will be needed in 1965—and that where too many resources are allocated in the long run they would be shifted to other uses. This would lead us to conclude that a reasonable estimate of supply for 1965 would be the same as that estimated for the demand.

In the estimate developed in the foregoing paragraphs no allowance was made for price support programs or for exports at prices below the domestic price level. Programs such as these involve agricultural and national policy and do not lend themselves to future projection to the same extent as the factors used in the estimate.

A final word of counsel may be appropriate. Any projection based on past trends and interpreted in the light of present knowledge involving the responses of millions of people who are influenced by attitudes, customs, income, prices, substitutes, and other factors that enter into their decisions, will at best be only an approximation. Therefore it seems that the method used, factors considered, and assumptions made are more important than the final figure. Because forecasting is a continuous process, familiarity with the procedure will enable you to adjust the projection where passage of time brings additional information that will cause a change in assumptions, or in weighting of factors, or in changes in the procedure.

GLOSSARY OF TERMS

Market milk.—Milk produced and handled under conditions which qualify it for fluid use in an organized marketing area; milk which meets the sanitary requirements of a city or State health department for sale or distribution as milk.

Manufacturing milk.—Milk intended for use in the production of a processed manufactured dairy product such as butter, cheese, and evaporated milk, and not qualified for fluid use by any health department.

Fluid milk.—That part of the market milk actually sold to consumers for those uses which require the milk to qualify for human use as fresh whole milk and related products such as fluid skim milk, butter-milk, and flavored milk.

Surplus milk.—That part of the market milk supply not used as fluid milk, and diverted to cream, ice cream, and other manufacturing uses not requiring

the same health department supervision as fluid milk.

Use classification.—A pricing plan by which handlers are charged for market milk. The milk is placed in various classes depending upon the products in which the milk is used. The Class I price is always the highest price. This class includes fluid milk, usually includes milk drinks, and may include fluid cream.

Flat price plan.—The type of transaction which exists between producers and a dealer in the absence of a classification price plan. The dealer pays one price or a flat price for all of his milk regardless of how it is used.

Blend price.—The price paid to producers for market milk when dealers buy according to classification prices. The blend is an average of class prices weighted by the volume of milk in each class. Usually

quoted at a specific point and for a specific test of milk.

Uniform price.—Similar meaning as blend price. Although the two terms are used frequently as having the same meaning, the term "uniform price" is more likely to be used to refer to the average price for a market while the term "blend price" is more likely to refer to the price paid by any one handler.

Base rating plan.—A means for providing the seasonally uniform producer of milk a higher price than is paid to producers whose production varies widely seasonally. The price received by milk producers is made up of two parts, a higher (base) price and a lower (excess) price. Each producer is assigned a base (an average of his deliveries during a specified period). During subsequent specified periods he receives the base price on a quantity of milk equal to his base and the excess price on all the milk delivered in excess of the base.

Base surplus plan.—This is often used synonymously with base rating plan.

Milk market.—A milk market consists of two parts, a production area known as a milkshed and a consuming area known as a marketing area.

Marketing area.—Each Federal and State order defines a marketing area and regulates the handling of milk by distributors within that area. Such an area usually includes one or more principal cities and their surrounding suburban areas.

Milkshed.—A milkshed is the area where producers are located who supply the primary and secondary markets with practically all of the milk used for fluid purposes.

Primary market.—A primary market is one which influences the prices which dealers pay for milk and which farmers receive for milk over its entire milkshed.

Secondary market.—A secondary market is a market located within the boundaries of the milkshed of a primary market. A secondary market usually small in population has its own milkshed but the prices in that milkshed are largely determined by the price paid in the milkshed of the primary market.

Butterfat differential.—A butterfat differential is an amount added to or subtracted from the quoted price for milk of a given fat content. It is applied on the basis of so many cents, usually from 5 to 12 cents for each 0.1 percent fat. Butterfat differentials usually differ for each class of milk with one differential being applied in paying producers for milk.

Location differential.—A location differential is an amount that is deducted from the quoted price at the

city plant in determining the price to be paid at country plants. Prices in most markets are quoted for milk received at city plants. In many of the larger markets milk also is received at country plants some at considerable distance from the marketing area.

Pool, dealer.—A dealer pool, or individual handler pool, as it is sometimes known, is when all producers of one distributor receive the same blend price for milk of the same quality at the same delivery point, regardless of how the milk of any one producer is used.

Pool, market.—A market pool is when the producers supplying a certain market receive a blend or uniform price calculated on the basis of the use of all of the milk received by all distributors in the market. Most of the Federal orders use a market pool and the uniform price is calculated by the market administrator. The market administrator maintains an equalization fund from which some distributors (whose uses of milk are valued lower than the average) receive money and into which other distributors (whose uses average a higher value) pay money. By means of the equalization fund, all producers receive the same price and yet the cost of milk to each distributor is determined by his own utilization.

Pool, cooperative.—A cooperative pool is one where the producers belonging to a cooperative all receive a blend price calculated on the basis of the use of all of the milk purchased by distributors buying from the cooperative.

Federal order.—A Federal order is a form of milk marketing regulation issued by the Secretary of Agriculture under the terms of the Agricultural Marketing Agreement Act of 1937.

State order.—A State order is a form of marketing regulation issued by a State milk control agency.

Bargaining cooperative.—An association of producers whose major function is to negotiate prices for producer members. If the association operates marketing facilities at all, this activity is usually a minor phase of the business.

Operating cooperative.—This is an association of milk producers who own and operate certain marketing facilities.

Necessary surplus.—Because sales of bottled milk and cream vary from day to day and because receipts from producers also vary, it is impossible for receipts from producers and fluid milk sales to be exactly equal. A surplus is necessary to take care of the fluctuations in sales and production. This quantity of surplus is referred to as a necessary surplus. In most markets it is considered necessary to have a surplus in the

month when production is lowest relative to sales equal to 15 to 20 percent of the average daily Class I sales.

Seasonal surplus.—In most markets, receipts of milk from producers vary rather widely seasonally because production reaches its peak during the spring months of the year. Fluid milk sales are rather constant from one month to another. The extra milk received from producers during the spring and summer months is referred to as seasonal surplus.

Steady or periodic surplus.—The amount of surplus in a market in any one month normally varies from year to year. This extra surplus which is neither due to seasonal variations in production nor necessary to service the market, frequently is referred to as steady or periodic surplus.

Compensatory payments.—In certain Federal orders these are payments which milk distributors must make on the fluid milk they buy from unregulated plants.

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